

HAWAII

CLIMATE ACTION PATHWAYS 2025

A GUIDE FOR A SAFE, AFFORDABLE,
AND RESILIENT HAWAII



Acknowledgements

Mahalo nui for the support of all partners in creating this document. This project has been funded in part by the United States Environmental Protection Agency (EPA) under assistance agreement 5D-98T67001-0 to the Hawai‘i Department of Land and Natural Resources (DLNR).

Project Core Team: This project was led by Leah Laramee (Hawai‘i Climate Change Mitigation & Adaptation Commission) with core guidance and support from Monique Zanfes (Managing Director Energy Efficiency and Renewable Energy, Hawai‘i State Energy Office). The team also included Udi Mandel, Jennifer VanderVeur, Jonathan Lance and Bill Unruh (Hawai‘i Climate Change Mitigation & Adaptation Commission).

Project Consulting Firm: Modeling work was performed by Sustainability Solutions Group (SSG).

Hui Participants: Mahalo nui to our partners who attended meetings and engaged in deliberations. They are:

- Agripelago
- Audubon Society
- Aloha Carbon
- Birds, Not Mosquitoes
- Bishop Museum
- Blue Planet Foundation
- Capitol Modern
- Carbon Cashback Hawai‘i
- Center for Getting Things Started
- Center for Marine Debris Research
- Citizens’ Climate Lobby
- City and County of Honolulu
- Climate Action Advisory Council
- Climate Future Forum
- Climate Hawai‘i
- Climate Resilience Collaborative
- Conservation International
- Council for Native Hawaiian Advancement
- County of Hawai‘i
- County of Kaua‘i
- County of Maui
- Eco-Rotary Club
- Elemental Impact
- Forest Solutions Hawai‘i
- Hanalei Initiative
- Hanalei Watershed Hui
- Hawai‘i Agriculture Research Center
- Hawai‘i Alliance of Nonprofit Organizations
- Hawai‘i Alliance for Progressive Action
- Hawai‘i Bicycling League
- Hawai‘i Board of Water Supply
- Hawai‘i Cattlemen's Council
- Hawai‘i Climate Coalition
- Hawai‘i Department of Agriculture and Biosecurity
- Hawai‘i Department of Business, Economic Development and Tourism
- Hawai‘i Department of Health
- Hawai‘i Department of Hawaiian Homes Lands
- Hawai‘i Department of Land and Natural Resources
- Hawai‘i State Energy Office
- Hawai‘i Department of Transportation
- Hawai‘i Energy
- Hawai‘i Gas
- Hawai‘i Green Growth
- Hawai‘i Islands Land Trust
- Hawai‘i Invasive Species Council
- Hawai‘i Green Infrastructure Authority
- Hawai‘i Office of the Governor
- Hawai‘i Pacific University
- Hawai‘i Public Health Institute
- Hawai‘i Public Utilities Commission
- Hawai‘i Rangeland Stewardship Foundation
- Hawai‘i State Library system
- Hawai‘i Wildfire Management Organization

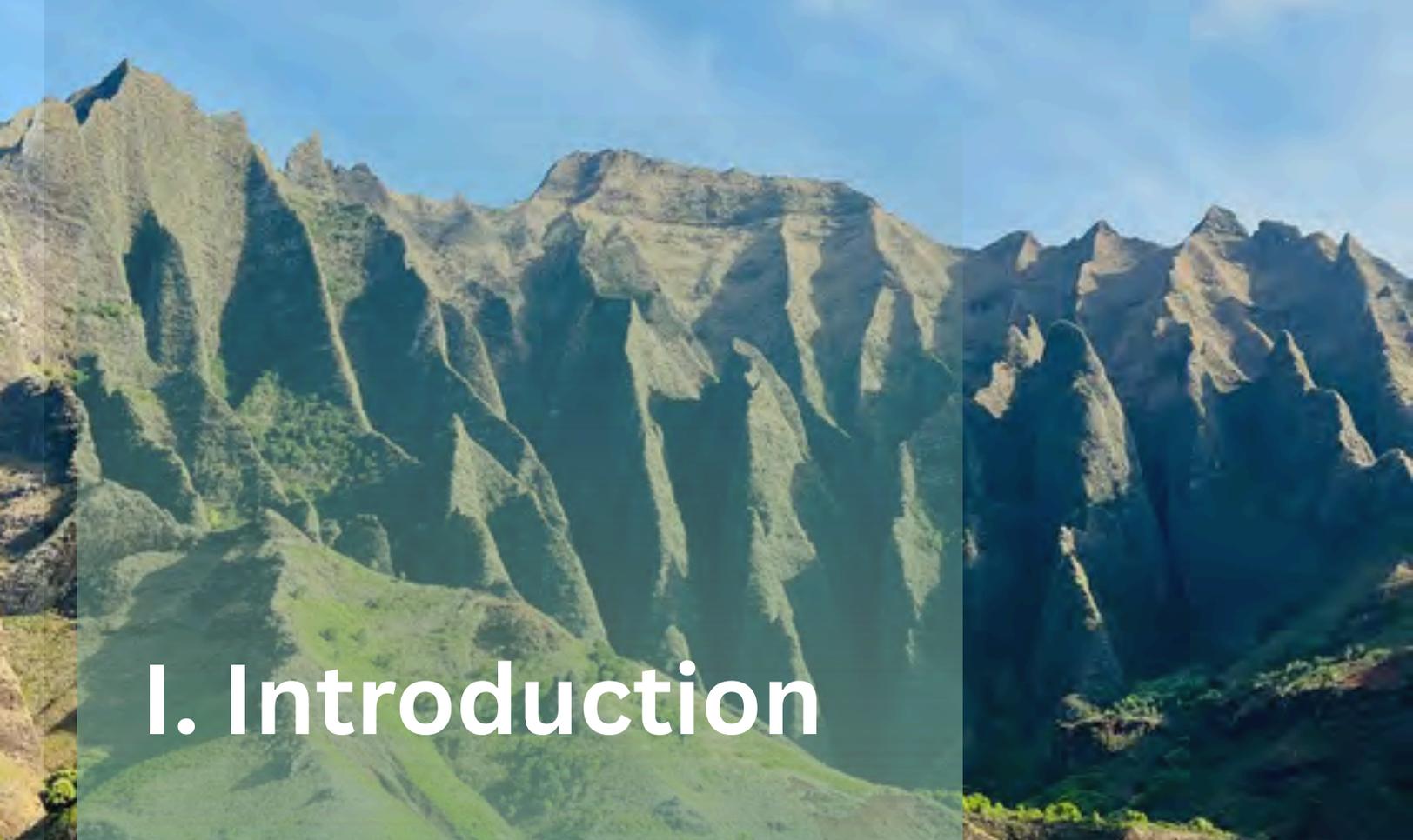
Hawai‘i Workforce Funders Collaborative	Surfrider
Hawaiian Airlines	Sustainable Coastlines
Hawaiian Electric	Sustainability Fellows
Ho‘omalau Ke Kai	Teran J. Young Foundation
Honolulu Museum of Art	The Climate Ready Hawai‘i AmeriCorps
Honolulu Neighborhood Board Association	The Nature Conservancy
Hua Nani Partners	VISTA Cohort
Hui O Hau‘ula	The Qan Group
Joelle Simonpietri	Ulupono Initiative
Kāko‘o Maui	United Nations CIFAL Honolulu
Kalukalu at 1624	University of Hawai‘i
Kaua‘i Climate Action Coalition	University of Hawai‘i Better Tomorrow
Kaua‘i Forest Bird Recovery Project	Speaker Series
Kaulunani Urban and Community Forestry	University of Hawai‘i Institute for
Kaunalewa	Sustainability and Resilience
Keiki O Ka ‘Āina	University of Hawai‘i Sea Grant College
Ke Kula Nui O Waimānalo	University of Hawai‘i Manoa Institute for
Kokua Foundation	Sustainability and Resilience
Kua‘āina Ulu ‘Auamo	University of Hawai‘i Mānoa
Kupu Hawai‘i	Kamakakūokalani Center for Hawaiian
Mālama Kaua‘i	Studies
Mālama Kua‘āina	USDA Forest Service
Mālama Learning Center	Vibrant Hawai‘i
Maui Climate Action Advisory Council	Wai Clean Water
Maui Economic Opportunity	We Are Oceania
Maui Forest Bird Recovery Project	West Maui Greenway
Maui Huliau Foundation	Zero Waste Kaua‘i
Maui Metropolitan Planning Organization	
Maui Ocean Center / Marine Institute	
Moloka‘i Community Service Council	
NOAA – National Oceanic Atmospheric	
Administration	
O‘ahu Metropolitan Planning Organization	
Office of Planning and Sustainable	
Development	
Pacific Biodiesel	
Papahānaumokuākea Marine Debris Project	
Par Hawai‘i	
Pilina ‘Āina	
Pono Pacific	
Punahou School	
Purple Mai‘a	
Recycle Hawai‘i	
Resilient Oahu	
Roberts Hawai‘i	
Sierra Club	

Acronyms and Abbreviations

AFOLU	Agriculture, Forestry, and Other Land Use
ALICE	Asset Limited, Income Constrained, and Employed
CAB	Clean Air Branch
CARP	County of Maui Climate Action and Resiliency Plan
CARPAC	Climate Action and Resiliency Plan Advisory Committee
CCMAC	Hawai‘i Climate Change Mitigation and Adaptation Commission
CE	Circular Economy
CPRG	Climate Pollution Reduction Implementation Grants
DABS	Department of Agriculture and Biosecurity
DBEDT	Department of Business, Economic Development and Tourism
DLNR	Hawai‘i Department of Land and Natural Resources
DOH	Department of Health (Hawai‘i)
DOH-CAB	Hawai‘i Department of Health-Clean Air Branch
ENSO	El Niño- Southern Oscillation Years
GHG	Greenhouse Gas
HAR	Hawai‘i Administrative Rules
HCEI	Hawai‘i Clean Energy Initiative
HPUC	Hawai‘i Public Utilities Commission
HGIA	Hawai‘i Green Infrastructure Authority
HEER	Hawai‘i Department of Health’s Hazard Evaluation and Emergency Response
HRS	Hawai‘i Revised Statute
HSEO	Hawai‘i State Energy Office
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
KCAAP	County of Kaua‘i Climate Adaptation and Action Plan
LIDAC	Low-Income and Disadvantaged Communities
LMI	Low to Moderate Income
MMTCO _{2e}	Million metric tons of carbon dioxide equivalent
NCA5	Fifth National Climate Assessment
PCAP	Priority Climate Action Plan
RFI	Request for Information
RPS	Renewable Portfolio Standards
SLH	Session Laws of Hawai‘i
TEK	Traditional Ecological Knowledge
TWG	Technical Working Group
UNFCCC	United Nations Framework Convention on Climate Change
U.S. EPA	United States Environmental Protection Agency

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I. Introduction

This document was developed in partnership with community members, State agencies, counties, technical experts, the University of Hawai‘i system, and non-governmental organizations across Hawai‘i to produce comprehensive Climate Action Pathways (CAP) to guide investment in policies, practices, and technologies that reduce pollutant emissions, increase affordability, enhance resiliency and safety, protect public health, create high-quality jobs, spur economic growth, and enhance the quality of life for all residents in Hawai‘i.

Hawai‘i has established itself as an international leader in comprehensive climate action, developing an extensive legislative and policy framework that addresses both climate change mitigation and adaptation over nearly two decades. The state's unique geographic position as an isolated island chain in the Pacific Ocean has created both vulnerabilities that demand urgent climate action, as well as opportunities to serve as a model for sustainable development and climate resilience. This CAP builds upon Hawai‘i's longstanding commitment to reducing greenhouse gas (GHG) emissions while simultaneously preparing communities and ecosystems for the unavoidable impacts of climate change.

1.1 Legislative Foundation for Climate Action

Hawai‘i’s climate policy framework began with groundbreaking legislation in 2007 when the state became one of the first in the nation to establish binding greenhouse gas emissions limits. Act 234, the Global Warming Solutions Act, declared that

"Climate change poses a serious threat to the economic well-being, public health, natural resources, and the environment of Hawai‘i," recognizing that major industries including tourism, agriculture, recreational and commercial fishing, and forestry were vulnerable to climate impacts.^{1, 2, 3}

The legislative framework expanded significantly in 2012 with the passage of Act 286, which added climate change adaptation priority guidelines to the Hawai‘i State Planning Act.⁴ This landmark legislation established climate change adaptation as one of seven major areas of statewide concern, requiring all state and county land use, capital improvement, and program decisions to consider climate adaptation impacts. The Act specifically addresses climate change impacts across multiple sectors including agriculture, conservation lands, coastal and nearshore marine areas, natural and cultural resources, education, energy, health, water resources, transportation, and the economy.

1.2 Institutional Framework and Coordination Mechanisms

Recognizing the need for coordinated institutional response, the state established the Hawai‘i Climate Adaptation Initiative through Act 83 in 2014.⁵ This legislation created the Interagency Climate Adaptation Committee (ICAC), administratively attached to the Department of Land and Natural Resources (DLNR) and co-chaired by the Chairperson of the Board of Land and Natural Resources and the Director of the Office of Planning (now the Office of Planning and Sustainable Development (OPSD)). The State’s climate governance structure was further bolstered with the establishment of the Hawai‘i Climate Change Mitigation and Adaptation Commission (CCMAC) in 2017 through Act 32.⁶ The Commission serves as the primary coordinating body for climate action and provides policy direction, facilitation, coordination, and planning among state and county agencies, federal agencies, and other partners as appropriate.

¹ Hawai‘i Climate Change Adaptation Framework, Ocean Resources Management Plan Working Group, November 2009, pp. 4, 24.

https://files.hawaii.gov/dbedt/op/czm/ormp/reports/climate_change_adaptation_framework_final.pdf

² Act 234, Session Laws of Hawai‘i 2007. https://health.hawaii.gov/cab/files/2023/05/SLH2007_Act234.pdf

³ Act 234, Session Laws of Hawai‘i 2007.

⁴ Act 286, Session Laws of Hawai‘i 2012, pp. 979-981.

https://data.capitol.hawaii.gov/sessions/sessionlaws/Years/SLH2012/SLH2012_Act286.pdf

⁵ Office of Planning, Adapting to Climate Change, State of Hawai‘i.

<https://planning.hawaii.gov/czm/initiatives/adapting-to-climate-change-2/>

⁶ Act 32, Session Laws of Hawai‘i 2017:

https://www.capitol.hawaii.gov/sessions/session2017/bills/GM1132_.PDF

1.3 Recent Legislative Advances and Decarbonization Goals

Hawai‘i’s climate ambitions reached new heights with the passage of Act 15 in 2018, which established the state as the first in the nation to commit to achieving carbon net-negative emissions by 2045.⁷ Act 238 (2022) supported this comprehensive decarbonization by setting an interim target requiring greenhouse gas emissions to be at least 50 percent below 2005 levels by 2030.⁸ The legislation also mandates annual greenhouse gas inventory reporting by the Department of Health to track emissions and monitor progress toward climate targets. According to the latest statewide inventory, total in-state greenhouse gas emissions were estimated at 20.32 million metric tons of carbon dioxide equivalent in 2022 (17.83 MMT CO₂ Eq including carbon sinks) an increase in emissions over 2021.⁹ Hawai‘i must increase its ambition if we are to achieve our 2030 and 2045 statewide emission targets.

1.4 State Agency Implementation and Coordination

Multiple state agencies have integrated climate considerations into their core functions and planning processes. CCMAC provides policy direction, facilitation, coordination, and provide strategies and goals on climate change action. The Commission is comprised of 12 State offices and agencies, all four county planning offices, and four legislative representatives. CCMAC is responsible for the Investing in Transportation Choices: Recommendations for Safe, Sustainable, Affordable, and Reliable Mobility,¹⁰ Sea Level Rise Vulnerability Assessment¹¹ accompanying Sea Level Rise Viewer,¹² “State’s Priority Climate Action Plan”.¹³ Hawai‘i State Energy Office (HSEO) promotes energy efficiency, renewable energy, and clean transportation to help achieve a resilient clean energy economy and developed the “Hawai‘i Pathways to Decarbonization”¹⁴ for decarbonization. The Department of Transportation (DOT) has published the “Climate Adaptation

⁷ Act 15, Session Laws of Hawai‘i 2018

https://www.capitol.hawaii.gov/sessions/session2018/bills/GM1115_.PDF

⁸ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization: Act 238, Session Laws of Hawai‘i 2022* (pp. 3-4). <https://energy.hawaii.gov/wp-content/uploads/2024/01/Act-238-HSEO-Decarbonization-Report.pdf>

⁹ Hawai‘i Department of Health. (2025, April). *Hawai‘i Greenhouse Gas Emissions Report for 2022*, (ES-3). <https://health.hawaii.gov/cab/files/2025/04/Final-2022-GHG-Emissions-Report.pdf>

¹⁰ Hawai‘i Climate Change Mitigation and Adaptation Commission. (2022, December) *Investing in Transportation Choices: Recommendations for Safe, Sustainable, Affordable and Reliable Mobility* <https://climate.hawaii.gov/wp-content/uploads/2023/07/Investing-in-Transportation-Choices-V6.pdf>

¹¹ Hawai‘i Climate Change Mitigation and Adaptation Commission. Sea Level Rise Vulnerability And Adaptation Report (2022), <https://climate.hawaii.gov/wp-content/uploads/2023/01/OCCL23-Sea-Level-Rise-Report-FY22-1.pdf>

¹² Hawai‘i State Sea Level Viewer, <https://www.pacioos.hawaii.edu/shoreline/slr-hawaii/>

¹³ Hawai‘i Climate Change Mitigation and Adaptation Commission. Hawai‘i Priority Climate Action Plan (2024) <https://climate.hawaii.gov/wp-content/uploads/2024/03/Hawaii-PCAP-FINAL-March-1-2024-1-3.pdf>

¹⁴ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization*

Action Plan”^{15,16} and is in development of the “Energy Security & Waste Reduction Plan”¹⁷ actions that contribute to decarbonization of the transportation sector.

The OPSD’s Costal Zone Management Program has a number of initiatives following coastal resiliency, including the “Assessing the Feasibility and implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawai‘i”.¹⁸

The Department of Health’s Clean Air Branch manages the state’s greenhouse gas program and conducts annual emissions inventories and leads the state’s Climate and Health Program.¹⁹

1.5 County-Level Climate Action

Recognizing that climate action requires coordinated efforts across all levels of government, Hawai‘i’s counties have developed comprehensive climate action plans tailored to their unique geographic and demographic characteristics. The City & County of Honolulu adopted its first Climate Action Plan for 2020-2025, establishing a roadmap for transitioning O‘ahu to 100% renewable energy (on the path to carbon neutrality) by 2045.²⁰ This plan provides “ambitious and achievable GHG emissions reduction strategies” that support the state’s goal of achieving net-negative emissions.²¹

The County of Hawai‘i has developed an Integrated Climate Action Plan (ICAP) with a vision to “ensure a just transition to a climate resilient island by addressing the causes and impacts of climate change through incorporating equitable climate mitigation and adaptation priorities into policies, programs, infrastructure, and decision-making”.²² The plan establishes three primary goals: increasing county capacity to implement climate action, reducing the county’s contribution to global greenhouse gas emissions, and increasing the resilience of county infrastructure, assets, and services to climate change impacts.

¹⁵ Hawai‘i Department of Transportation. (2021) Climate Adaptation Action Plan <https://hidot.hawaii.gov/wp-content/uploads/2021/07/HDOT-Climate-Resilience-Action-Plan-and-Appendices-May-2021.pdf>

¹⁶ Hawai‘i Department of Transportation. Hazard Viewer, <https://hidot.hawaii.gov/resilience/>

¹⁷ Hawai‘i Department of Transportation. Hawai‘i Energy Security and Waste Reduction Plan, <https://highways.hidot.hawaii.gov/stories/s/h9gp-xxmt>.

¹⁸ Hawai‘i Costal Zone Management. (2019) Assessing The Feasibility And Implications Of Managed Retreat Strategies For Vulnerable Coastal Areas In Hawai‘i https://files.hawaii.gov/dbedt/op/czm/ormp/assessing_the_feasibility_and_implications_of_managed_retreat_strategies_for_vulnerable_coastal_areas_in_hawaii.pdf.

¹⁹ Hawai‘i Department of Health. (2025, April) *Hawai‘i Greenhouse Gas Emissions Report for 2022*, <https://health.hawaii.gov/cab/files/2025/04/Final-2022-GHG-Emissions-Report.pdf>

²⁰ City & County of Honolulu. Climate Action Plan 2020-2025, p.11. <https://resilientoahu.org/s/Climate-Action-Plan.pdf>

²¹ City & County of Honolulu, Climate Ready O‘ahu (2024), <https://www.resilientoahu.org/climatereadyoahu>

²² County of Hawai‘i. Integrated Climate Action Plan (ICAP) for the Island of Hawai‘i, County of Hawai‘i, May 13, 2025. <https://cohplanning.konveio.com/integrated-climate-action-plan-icap-island-hawaii>

Maui’s Climate Action and Resiliency Plan (CARP) is currently under review and is set to identify actions to achieve net-negative emissions and 100% renewable energy.

Kaua‘i’s County Climate Adaptation and Action Plan (2025) targets an 83% reduction in operational carbon emissions by 2045 compared to 2005 levels through energy efficiency, renewable energy transitions, and waste reduction.²³ The draft Plan serves as a the roadmap for County departments to strengthen the community’s adaptive capacity and achieve GHG targets through 79 different strategies, including new or modified County programs, public investments, requirements for future development, and cross-sector partnerships. Strategies address sea level rise, flooding, wildfire, heat, cyclones, with an emphasis on equity and prioritizing actions that simultaneously address affordability on the island.

These county plans show the commitment to Climate Action across all counties in Hawai‘i, and the measures presented in the State Climate Action Pathways are envisioned as a way to further support and cooperate with the counties.

1.6 Current Priorities and Implementation Framework

Hawai‘i is facing a cost-of-living crisis affordability that is out of reach for many Kanaka and Kama‘āina alike. Life threatening hurricanes, drought, extreme heat, flooding and wildfires are increasing in frequency taking lives, livelihood and reducing public health. This document identifies 36 key measures across multiple sectors designed to achieve significant greenhouse gas reductions to reduce Hawai‘i’s contribution in increasing the frequency of these disasters while also addressing affordability, support vulnerable communities, enhance resiliency and safety, protect public health create high-quality jobs, spur economic growth, and enhance wellbeing in Hawai‘i. These measures were identified by experts in each focus area based on their greenhouse gas reduction potential, implementation readiness, and ability to provide co-benefits including job creation, equity, improved air quality, enhanced climate resilience, and economic development. from 2025 through 2045. The plan emphasizes that “the climate crisis has already cost Hawai‘i lives, a price much higher and more devastating than even the most pessimistic predicted”, underscoring the urgency for immediate and sustained action.²⁴ This comprehensive foundation of legislation, institutional coordination, and multi-level planning that the Climate Action Pathways document lays out positions Hawai‘i to advance ambitious climate action across the State, building upon nearly two decades of climate policy development and implementation experience.

²³ County of Kaua‘i. (March 2025) Kaua‘i Climate Adaptation and Action Plan, p15.

https://kauaiadaptation.com/wp-content/uploads/2025/04/KCAAP_PublicDraft_PartI_032425_Clean-1.pdf

²⁴ Hawai‘i Climate Change Mitigation and Adaptation Commission. Hawai‘i Priority Climate Action Plan (2024)

2. Measures

The following table summarizes the 36 measures that are key to meeting the targets set in this CAP. Details of each Measure are provided in the sector specific chapters which include: Overview; Key Features; Challenges and Opportunities; Numbers and Targets; Challenges and Innovations; County-Level Variations and Actions; Costs; and Funding Sources.

Measure	Measure Description	Target
Energy		
<p>1. INCREASE RENEWABLE ENERGY GENERATION</p> <p><u>EMISSION REDUCTIONS (2030-2045)</u></p> <p>17.75 MMT CO₂E (MILLION METRIC TONS OF CARBON DIOXIDE EQUIVALENT)</p> <p><u>COST TO IMPLEMENT</u> <u>\$230M</u></p> <p><u>AVOIDED FOSSIL FUEL COSTS</u> <u>\$467M</u></p>	<p>Increase the presence of utility-scale and distributed solar photovoltaic (PV), onshore wind, geothermal, and biodiesel to replace current fossil fuel electricity generation.</p> <ul style="list-style-type: none"> • Interagency task force under HRS §196-1.5 to regularly monitor development timelines, permit status, and identify potential roadblocks. 	<p>By 2045 increase electricity generation by:</p> <ul style="list-style-type: none"> • 273.66 GWh (gigawatt hour) biodiesel • 1703.9 GWh distributed solar • 318.0 GWh geothermal • 640.0 GWh onshore wind • 2645.5 GWh utility-scale solar • 344.3 GWh renewable natural gas
<p>2. PERMITTING IMPROVEMENTS TO MEET RENEWABLE PORTFOLIO STANDARD (RPS) TIMELINES</p>	<p>Identify permitting improvements to meet RPS timelines, facilitate community benefits, and explore dispute resolution outside of court.</p>	

Measure	Measure Description	Target
Energy		
3.EFFICIENCY IMPROVEMENTS TO POWER PLANTS THAT USE FOSSIL FUELS	Require efficiency improvements to power plants that use fossil fuels to ensure that power plant replacements significantly reduce energy waste, which will save fuel cost and emissions.	
4.RESILIENCY IMPROVEMENTS TO POWER GRID	<p>1. Support deployment of grid-stability technologies, including Synchronous Condenser Conversion Projects (SCCT), to reduce outage risk during extreme events and stabilize island grids with high penetrations of renewable energy</p> <p>2. Bury electric distribution lines and communication infrastructure where sea-level rise exposure is low to reduce outages from storms, falling trees, and wind.</p>	
Buildings and Energy Efficiency		
<p>5. DISTRIBUTED SOLAR PV</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 7.5 MMT CO₂e</p> <p><u>COSTS TO IMPLEMENT</u> \$4,319M</p> <p><u>ENERGY BILL SAVINGS</u> \$3,262M</p>	<p>Deployment of renewable energy and energy storage systems for buildings, parking lots and urban spaces.</p> <ul style="list-style-type: none"> • Low-cost solar loans for LMI households. • Utility energy buyback programs to help offset costs. • Building code requirements for new buildings to be solar ready. 	<p>Increase capacity of solar in residential buildings:</p> <ul style="list-style-type: none"> • Solarize 10,000 rooftops annually for 5 years until 2030 • From 2030 solarizing at an increase rate of 7% per year. • Reduce new household energy consumption 19% through solar water heater installation. <p>Increase capacity of solar in non-residential buildings:</p> <ul style="list-style-type: none"> • 4,146 Megawatt by 2050.

Measure	Measure Description	Target
Buildings and Energy Efficiency		
<p>6. BUILDING ENERGY EFFICIENCY AND UPGRADES</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 3.7 MMT CO₂e</p> <p><u>COST TO IMPLEMENT</u> \$12,115M</p> <p><u>ENERGY BILL SAVINGS</u> \$23,244M</p>	<p>Upgrade existing buildings to decrease energy consumption by increasing energy efficiency in residential and non-residential buildings.</p> <ul style="list-style-type: none"> • Energy Audits • Water and energy efficient appliances and fixtures • Weather proofing • Technical training for state and county facilities personnel 	<p>Reduce building energy consumption by 46.6% by 2040</p>
<p>7. BUILDING RESILIENCE UPGRADES</p> <p><u>COSTS TO IMPLEMENT</u> \$260M for home retrofit actions</p>	<ol style="list-style-type: none"> 1. Strengthen existing and new homes to extreme weather. <ul style="list-style-type: none"> • Funding, technical assistance, and outreach 2. Implement climate-smart neighborhood design with shade, permeable surfaces, green-street retrofits, and reflective materials. 3. Strengthen and climate-proof critical infrastructure through hardening, undergrounding, flood protection, and relocation or redundancy of vulnerable roads and lifelines. 	<p>Retrofit 8,000 homes over 5 years.</p>
<p>8. NEW BUILDING CODES</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 0.0011 MMT CO₂e</p> <p><u>ENERGY COST SAVINGS</u> (\$6M) savings</p>	<ol style="list-style-type: none"> 1. Decrease energy consumption in new buildings by adopting the progressive energy efficiency building codes. <ul style="list-style-type: none"> • Workshops and technical training for contractors and state and county facilities personnel. 	<p>Adopt 2024 International Energy Conservation Code building standards in new buildings by 2030 for a decrease of 18% in energy consumption.</p>

Measure	Measure Description	Target
Ground Transportation		
<p>9. VEHICLES ELECTRIFICATION</p> <p>EMISSION REDUCTIONS (2026-2045) -10.7 MMT CO₂e</p> <p>FUEL COST SAVINGS \$1,130M</p>	<p>Transition all rental vehicles to electric models by 2040.</p>	<p>All rental vehicles are ZEV by 2040.</p>
<p>10. PERSONAL EVs AND FUEL DE-CARBONIZATION</p> <p>EMISSION REDUCTIONS (2026-2045) - 27 MMT CO₂e</p> <p>FUEL COST SAVINGS \$51M</p>	<p>Electrify ground transportation</p> <ul style="list-style-type: none"> • Transition personal vehicles to ZEV. • Transition all State fleets to ZEV. • Transition County buses & vehicles to ZEV. • Expand electric vehicle charging infrastructure • Require electric vehicle charging in new buildings <p>As EVs are phased in, decarbonize ground transportation fuels.</p> <ul style="list-style-type: none"> • Develop infrastructure for clean fuels and blends • Support Clean Fuel Standard • Conduct an Affordability Study to find the best legal framework for Hawai'i's particular resources and challenges. 	<p>Adopt 2024 International Energy Conservation Code building standards in new buildings by 2030 for a decrease of 18% in energy consumption.</p>
<p>11. MODE SHIFT</p> <p>EMISSION REDUCTIONS (2026-2045) - 4.9 MMT CO₂e</p> <p>FUEL COST SAVINGS \$562</p>	<p>Encourage selection of transportation away from single occupancy vehicles to car share, walking, biking and transit.</p> <ul style="list-style-type: none"> • Implement Priority Multimodal Network connecting residents to work and play through protected bike lanes, bus only lanes and sidewalks. • Strategically site & incentivize affordable, compact & transit-oriented development. • Community incentives such as county transit free for youth, rebates for electric bikes and scooters, ridesharing and vanpool participation. • Parking Cash-Out • Assess and implement road usage pricing after multimodal infrastructure is installed. • Expand transportation options for visitors including electric vehicle rentals, shuttles and transportation passes. 	<p>Reduce VMT by 20% by 2045 through active transportation, building compact, complete communities, increasing transit use, and road pricing programs actions.</p> <p>Increase transit service hours by 2% each year, starting in 2026 until 2045.</p> <p>Add 10 miles of bike lane infrastructure to each urban center annually.</p>

Measure	Measure Description	Target
Air Transportation		
<p>12. FUEL DE-CARBONIZATION</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 59.3 MMT CO₂e</p> <p>- <u>ADDITIONAL COST OF SAF</u> \$12,150M</p>	<p>Decarbonize air transportation fuels</p> <ul style="list-style-type: none"> • Support Clean Fuel Standard • SAF industry working group to addresses barriers to meeting SAF goals and use of other zero carbon fuels • Assess existing infrastructure, Supply Chain and Distribution Pathways for SAF • Monitor developments in scale up of zero carbon fuels such as eSAF and green hydrogen 	<p>Reduce airplane emissions by blending sustainable aviation fuels (SAF) with jet fuel (20% by 2040).</p>
<p>13. REDUCE FUEL CONSUMPTION IN AIR TRANSPORTATION</p>	<p>Reducing aviation fuel consumption in airports</p> <ul style="list-style-type: none"> • Revise airline scheduling to stagger departures and arrivals to reduce idling • Optimize aircraft ramp movements to prevent congestion and delays • Complete airspace modernization strategy and implement • Expand number of gates to reduce aircraft idling time following landing 	<p>Reduce airplane emissions by 20% of current levels by increasing the fuel-efficient operation of airplanes.</p>
<p>14. AIRCRAFT ELECTRIFICATION</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) -0.73 MMT CO₂e</p> <p><u>ENERGY COST SAVINGS</u> \$78M</p>	<p>Electrify air transportation operations and aircrafts</p> <ul style="list-style-type: none"> • Conversion of airfield vehicles to ZEV • Conversion of ground support equipment to ZEV • Installation/expansion of EV charging infrastructure to support landside vehicles • Engage with airlines • Conversion of all mobile equipment to electric 	<p>Reduce airport operation and airplane emissions by electrifying aircraft and ground operations vehicles.</p>
Marine Transportation		
<p>15. FUEL DECARBONIZATION</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 8.3 MMT CO₂e</p> <p>- <u>ADDITIONAL COST OF SMF</u> \$1,024M</p>	<p>Promote the use of renewable fuels such as biodiesel, e-methanol, e-ammonia, bio-Liquidified Natural Gas, and green hydrogen in marine transportation vessels.</p>	<p>Reduce marine vessel emissions to zero by 2045.</p>

Measure	Measure Description	Target
Marine Transportation		
<p>16. ENERGY EFFICIENCY IN CRUISE SHIPS</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 0.76 MMT CO₂e</p> <p><u>FUEL COST SAVINGS</u> \$35.1M</p>	<p>Reduce cruise ship emissions by:</p> <ul style="list-style-type: none"> • Reducing number of cruise ship calls • Reducing size of cruise ships allowed to dock • Increasing cruise ship operations efficiency • Using sustainable marine fuels 	<p>Reduce cruise ship emissions to zero by 2045.</p>
Agriculture Forestry and Other Land Use		
<p>17. AGRICULTURAL SOIL AMENDMENT</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 0.2 MMT CO₂e</p> <p><u>FERTILIZER USE COST SAVINGS</u> \$51M</p>	<p>Capture carbon in soils</p> <ul style="list-style-type: none"> • Integrate waste and land management systems to recapture nutrients and generate soil carbon amendments Engage 'āina stewards, local meat processors, and agricultural producers. • Biochar pilot program for carbon soil capture. • New infrastructure and facilitates. • Increase technical assistance and resources for land stewardship and agricultural production. 	<p>Improve soil management to capture and store 10% more carbon</p>
<p>18. NATURE-BASED MITIGATION SOLUTIONS (FORESTS AND WETLANDS)</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 11.7 MMT CO₂e</p> <p><u>COSTS TO IMPLEMENT</u> \$220M</p>	<ol style="list-style-type: none"> 1. Protect existing native ecosystems through land acquisition, invasive species prevention & management, and wildfire prevention. 2. Restore forests and establish novel ecosystems. 3. Enhance tree equity in urban spaces increasing resilience and offsetting urban heat island effect, including alongside roads and bicycle lanes. 	<p>Protect 30% of Priority Watersheds, 843,000 acres, by 2030.</p> <p>Plant 11 million native trees.</p> <p>Preserve 23,000 acres of forested lands.</p> <p>Increase urban forestry canopy</p>

Measure	Measure Description	Target
Agriculture Forestry and Other Land Use		
<p>19. NATURE-BASED RESILIENCE SOLUTIONS</p> <p><u>COSTS TO IMPLEMENT</u> \$687.5M</p>	<p>1. Implement the Strategic Plan for Hawai'i Wetlands</p> <p>2. Reduce wildfire risk through landscape scale fuel management, defensible space around structures, and greenbelts/firebreaks using drought tolerant native species.</p> <p>3. Strengthen natural resilience by restoring reefs, dunes, wetlands, loko'i'a, and watersheds; expanding native vegetation; and improving water conservation and recycled-water use to protect streamflow and aquifers.</p>	<p>Restore 20 wetland and loko'ia (traditional fishpond aquaculture)</p> <p>Wildfire fuel management on 20,625 acres annually, 103.125 acres over 5 years.</p>
Waste		
<p>20. WASTE DIVERSION</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 3.6 MMT CO2e</p> <p><u>COSTS TO IMPLEMENT</u> \$55M</p>	<p>Divert waste from landfill & waste to energy.</p> <ul style="list-style-type: none"> • Infrastructure investments in Regional Material Recovery Hubs with advanced sorting facilities, remanufacturing centers, repair and reuse marketplaces. <ul style="list-style-type: none"> o Battery and solar panel repurposing o Construction material/waste recycling hubs • Extension of the O'ahu Island "Transfer Station Reusable Material Collection Site" project. • Installation of dishwashers and mobile washing stations to reduce food waste and reliance on single-use materials. • Implementing a reuse and refill program for food and beverage packaging (collection, washing, and logistics infrastructure to support the circulation of reusable items). • Urban mining ventures recovering metals from landfills 	<p>Waste being diverted from final disposal or treatment to reach:</p> <ul style="list-style-type: none"> • 70% by 2030 • 90% by 2050

Measure	Measure Description	Target
Waste		
<p>21. WASTEWATER</p> <p><u>EMISSION REDUCTIONS</u> (2026-2050) - 0.7 MMT CO₂e</p> <p><u>COSTS TO IMPLEMENT</u> \$5 billion estimate</p>	<p>Accelerate Cesspool Conversion with advanced technologies such as nature-based individual wastewater systems, aerobic treatment units, or neighborhood-scale cluster systems to provide minimal environmental impact.</p> <ul style="list-style-type: none"> • Point of sale cesspool conversion policy 	<p>100% Priority 1 Cesspools Converted by 2030 100% Priority 2 Cesspools Converted by 2035 100% of Cesspools in Converted by 2045</p>
<p>22. COMPOSTING</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 4.3 MMT CO₂e</p> <p><u>COSTS TO IMPLEMENT</u> 48.7M</p>	<p>Divert organic waste from landfills through expanding the production, distribution, and application of compost by building a decentralized, community-based compost network in controlled conditions in sealed containers for accelerated composting.</p>	<p>As part of overall waste reduction goals:</p> <ul style="list-style-type: none"> • 70% by 2030 • 90% by 2050
<p>23. AVOIDING WASTE GENERATION</p> <p><u>EMISSION REDUCTIONS</u> (2026-2045) - 0.2 MMT CO₂e</p>	<p>Avoid the generation of waste by revisiting packaging and consumption patterns.</p> <ul style="list-style-type: none"> • Implement recommendations from Department of Health's waste reduction needs assessment including extended producer responsibility policies. • Create the Hawai'i Circular Economy Commission. 	<p>10% reduction in waste generation rates by 2040.</p>
Carbon Pricing		
<p>24. CARBON PRICE OF \$150/TON BY 2045</p> <p><u>EMISSION REDUCTIONS</u> (2028-2045) -23.2 MMT CO₂e</p> <p><u>COST TO IMPLEMENT</u> 12.980B lin revenue</p>	<p>Increase established carbon pricing from the current \$8 per ton equivalent to \$10 per ton to address the social cost of carbon and shift fossil fuel consumption. Gradual increasing to reach the current rate of the social cost of carbon currently estimated at \$150 per ton.</p> <p>2028: \$10/ton 2030: \$26/ton 2035: \$68/ton 2040: \$108/ton 2045: \$150/ton</p>	<p>Reduction of fossil fuel use. Revenue for generation for climate action. Equity distributions for LMI communities.</p>

Measure	Measure Description	Target
Circular and Wellbeing Economy		
<p>25. ECONOMIC INCENTIVES TO ACCELERATE CIRCULAR INNOVATION</p>	<ol style="list-style-type: none"> 1. Tax reforms favoring circular practices such as products and materials that can be repaired, reused or composted, and sharing of resources and materials. 2. Establish statewide Buy Clean policies to purchase low carbon products. 3. Incorporate Green Budgeting in the state budget process to track where funding is being spent. 4. Improve incorporation options for cooperatives. 5. Establish a Circular Economy consortium to support transition and encourage innovation in the sector. 	<p>30% tax rebates for companies achieving 50% closed-loop material use.</p> <p>Levies on non-recycled plastics, metals, and textiles: 5% in 2026 to 20% by 2030</p> <p>Establish Buy Clean standards across 8 categories (paper, construction, etc.)</p> <p>Green budgeting for "Green Fee" by 2026 and State budget by 2030.</p>
<p>26. MONITORING FRAMEWORK</p>	<ol style="list-style-type: none"> 1. Ensure that regulating agencies are adequately staffed and compensated to ensure thorough, expert, timely approvals, and robust enforcement. 2. Consumption-based inventory of GHG to supplement the production-based inventory to more holistically account for imported emissions. 3. Development of Circular Economy Index measuring re-use of materials and 'Āina Resilience Matrix combining measures of soil health and native species recovery metrics. 4. Tourism Industry specific accounting of energy use, vehicle miles travelled and waste. 	<p>Supportive frameworks to ensure holistic and comprehensive transition.</p>

Measure	Measure Description	Target
Circular and Wellbeing Economy		
27. COMMUNITY PARTICIPATION & CONSULTATION	<ol style="list-style-type: none"> 1. Utilize community-based organizations for state and county outreach and consultation. 2. Create one-stop-shop for affordability and resiliency support and discounts to streamline community engagement in climate resiliency and affordability programs 	Increased and meaningful community engagement and utilization of climate resiliency and affordability programs.
Workforce and Education		
28. EDUCATION & WORKFORCE DEVELOPMENT	<ol style="list-style-type: none"> 1. Expand Department of Education’s Career and Technical Education Program for high schools and Hawai’i community colleges to include more green jobs and externship opportunities. <ul style="list-style-type: none"> ◦ Additional staff positions at DOE focused on climate and ‘āina curriculum, and CTE programs ◦ Expand opportunities and incentives for teacher training and curriculum development in green and climate jobs 2. Identify skillsets and pathways needed in different green job sectors 3. Integrate stackable credentials to create carer pathways 4. Increase paid apprenticeships, pre-apprenticeship and project-based learning in the workplace in green job sectors. 5. Increase capacity at DLIR to coordinate. 6. Collaboration across government, communities, workforce systems, labor unions, industry, community-based organizations, and educational institutions. 	<p>Strengthen the ecosystem of state, non-profit and private actors working in the green jobs and climate education and circular economy space through supporting initiatives that:</p> <ul style="list-style-type: none"> • Bring climate education to schools. • bridge schools with the workplace offering project-based learning opportunities.

Measure	Measure Description	Target
Health and Resilience		
<p>29. FINANCE AND GOVERNANCE</p> <p><u>COSTS TO IMPLEMENT:</u> \$15M</p>	<ol style="list-style-type: none"> 1. Increase and Expand the Climate Impact Fee to address resiliency needs 2. Establish a Permanent Hawai'i Climate Change Office (COST: \$3M annually) 3. Create a Hawai'i Climate Resilience Fund 4. Establish a Hawai'i Disaster Recovery Fund 	<p>Provide sufficient funding to ensure a climate ready Hawai'i</p>
<p>30. INSURANCE</p>	<p>Address rising insurance rates through supportive programs.</p> <ul style="list-style-type: none"> • Reduce Insurance Costs Through Mitigation Credits • Standardize Insurance Claim Timelines and Reporting • Provide Targeted Premium Assistance and Last-Resort Coverage 	<p>Affordable and comprehensive insurance</p>
<p>31. COMMUNITY EMPOWERMENT & RESILIENCE BUILDING</p> <p><u>COSTS TO IMPLEMENT:</u> \$60M over 5 years</p>	<p>Establish resilience grant program in collaboration with state and counties offices to support community hubs and programs that build community resilience to climate hazards, threats, risks and impacts. Examples:</p> <ul style="list-style-type: none"> • Tool libraries for appliances, gear. • Repair circles and material swaps • Microgrids • Food banks • Emergency management • Job and skill training 	<p>Resilience programs in all identified LIDAC communities</p>

Measure	Measure Description	Target
Health and Resilience		
32. RESILIENCE TO EXTREME WEATHER	<ol style="list-style-type: none"> 1. Implement Existing State and County Recommendations. 2. Emergency Preparedness and Disaster Support. <ul style="list-style-type: none"> o Publish Clear Disaster Housing Guidance o Develop Multimodal Evacuation Pathways. o Promote Low-Congestion Evacuation Transportation. o Coordinate Evacuation Training and Response. o Expand and Modernize Hawai'i Hazards Awareness and Resilience Program. 	Robust climate resilience and disaster preparedness.
33. HEALTH AND CLIMATE CHANGE	Address climate and health challenges and impacts with a comprehensive action plan including the 48 recommendations in the health chapter on extreme heat, air pollution and allergens, drought, environmental degradation, wildfires, severe weather & floods, water quality, mental health & wellbeing, food system impacts and crosscutting issues.	
Tourism		
34. TOURISM	<ol style="list-style-type: none"> 1. Develop a tourism-specific GHG inventory that accounts for all relevant emission sources, including a complete assessment of visitor air travel's total climate impact. 2. Ensure consistent implementation and rigorous enforcement of state and county policies land use reform, building performance standards, and waste management. 3. Investment in regenerative practices that actively restore natural ecosystems, support cultural preservation, and enhance community well-being. 4. Intensify efforts to educate visitors on responsible travel practices such as "Travel Pono" and the unique ecological and cultural sensitivities of the islands. 5. Continue to support the diversification of Hawai'i's economy to reduce over-reliance on tourism, while simultaneously building resilience within the tourism sector itself to withstand future climate-related disruptions and economic shocks. 	

Measure	Measure Description
Military	
35.LEVERAGE MILITARY RESOURCES FOR CLIMATE READINESS	1. Collaboration of Climate Resilience infrastructure 2. Develop partnerships with military installations to engage skilled staff for training and mentoring opportunities
Youth	
36. YOUTH LEADERSHIP IN DECISION-MAKING	1. Direct participation in climate planning and implementation 2. Representation from communities disproportionately affected 3. Meaningful authority and decision making of youth in policy making

Figure 1 summarizes the potential year-over-year emissions reductions of the measures modeled in the CAP. The top line represents the projected business-as-usual emissions for the state. Each colored “wedge” of the diagram represents the emissions reduction potential of each modeled measure. The grey area under the wedges represents the remaining emissions expected to be produced – those that have not been eliminated by measures. The dotted line represents the total emissions reductions of the measures modeled. The figure shows emissions reductions between 2025 and 2050 under the modeled measures.

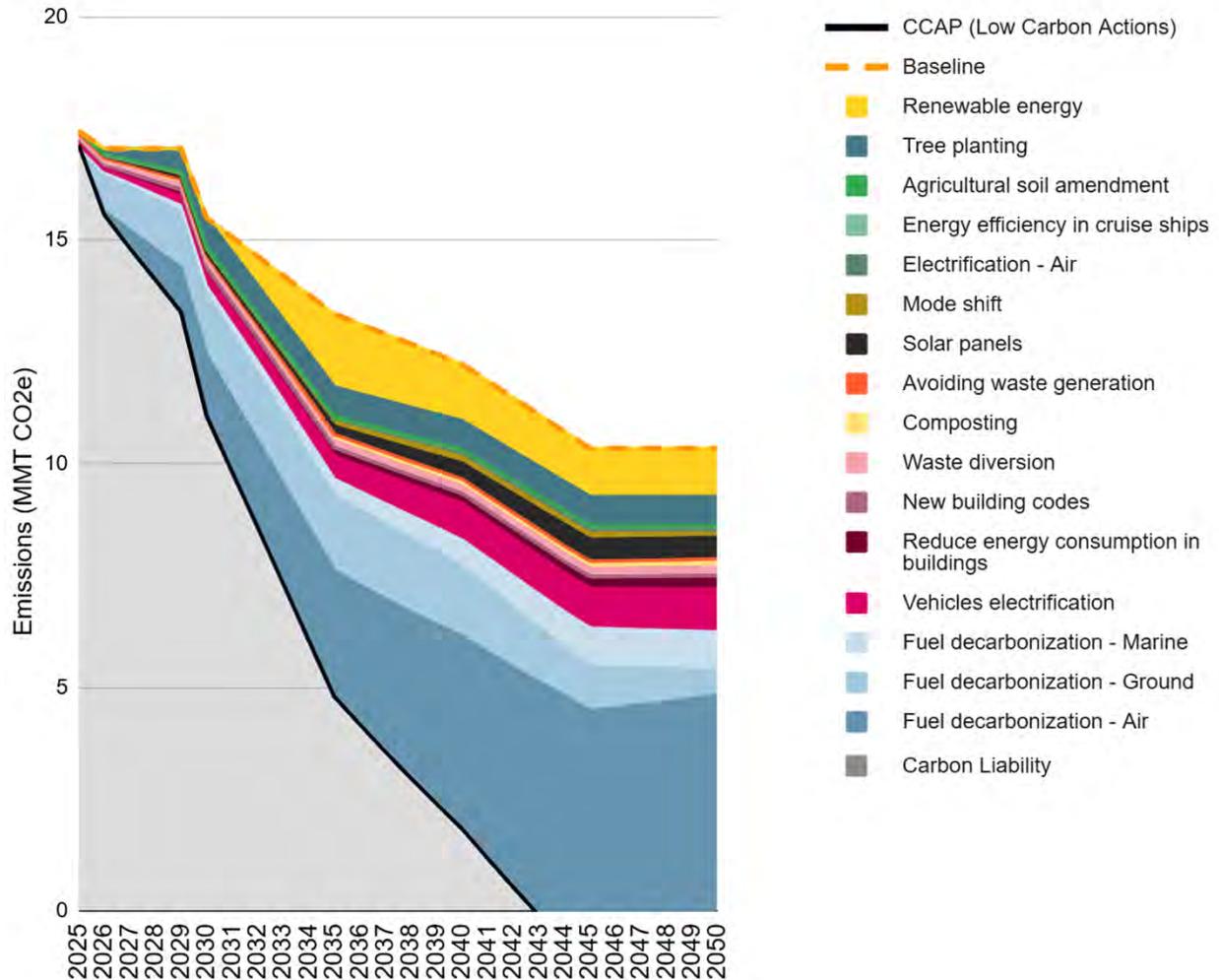


Figure 1: Wedges Diagram: CAP Measures' Year-Over-Year GHG Emissions Reductions.

Measure: Carbon Pricing

A carbon pricing measure was modeled to estimate its effect on further reducing emissions. Assumptions:²⁵

- For every increase of \$10/ton, emissions are reduced by 5.5% in the residential sector.
- For every increase of \$10/ton, emissions are reduced by 2% in the commercial sector.
- Carbon pricing’s effectiveness at reducing emissions is non-linear. As prices reach a certain value, emissions reductions begin to level off. It is assumed here that carbon pricing is half as effective at reducing emissions in 2045 as in 2028.
- The current carbon is \$8/ton.
- The carbon price increases to \$10/ton in 2028 and then by \$8/ton/year until it reaches \$150/ton in 2045.
- Carbon pricing effects on industrial processes are not included.

The Table below summarizes the effects of the carbon pricing under these assumptions.

	2028	2030	2035	2040	2045	Cumulative 2028-2045
Total emissions from fossil fuel use (MMTCO ₂ e)	11.6	11.4	10.9	10.5	10.2	194.3
Total emissions reduced by carbon pricing (MMTCO ₂ e)	0.4	0.6	1.2	1.7	2.1	30.4
Carbon price (\$/ton)	10.00	26	68	108	150	
Annual carbon price collections (\$ millions)	112.4	283.7	655.0	962.1	1,221.4	12,980
NPV (3%)						9,210

Table 1: Carbon pricing measure calculation results for milestone years.

As shown in the following figure, the carbon price is effective at reducing emissions on the same order as other major measures. The following figure summarizes the projected emissions from fuels versus the emissions under a \$150/ton carbon price in 2045.

²⁵ Based on averages taken from a survey of the literature on the effectiveness of carbon pricing, including from: Köppl, A., & Schratzenstaller, M. (2023). Carbon taxation: A review of the empirical literature. *Journal of Economic Surveys*, 37, 1353–1388. <https://doi.org/10.1111/joes.12531>

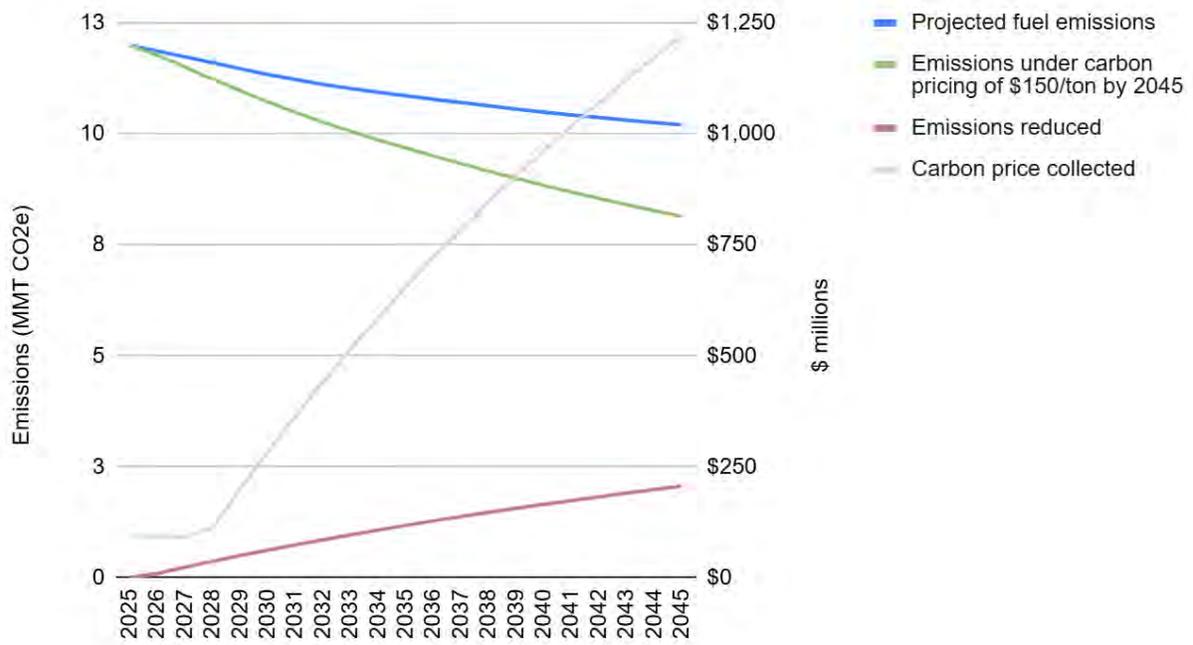


Figure 2: Comparison of Total Projected Fossil Fuel Emissions versus Total Emissions Under the Effect of a \$150/ton Carbon Price by 2045. Revenues Collected by Carbon Pricing are on the Second Vertical Axis.



3. Financing the Transition to Climate Resilience

MEASURES

INCREASE AND EXPAND THE CLIMATE IMPACT FEE

ESTABLISH A PERMANENT HAWAI'I CLIMATE CHANGE OFFICE

CREATE A HAWAI'I CLIMATE RESILIENCE FUND

ESTABLISH A HAWAI'I DISASTER RECOVERY FUND

3. Funding the Transition to Climate Resilience

Hawai‘i is uniquely vulnerable to the impacts of climate change and must take bold, urgent action to reduce greenhouse gas emissions and strengthen climate resilience. The measures laid out in this CAP lead Hawai‘i to meet its goals of net zero carbon emissions by 2045, move its economy away from fossil fuel dependency and towards greater energy security and affordability and build safe climate resilient infrastructure for generations to come. The total cost of enacting these GHG reduction measures is estimated at \$39 billion between 2026-2045.²⁶ Though the number seems insurmountable the total realized savings from the implementation of these measures over this time period is calculated at \$28.8 billion with a further \$12.9 billion raised in Carbon Pricing revenue. These savings are realized over time, starting in 2026 and continuing beyond 2045, as we transition away from fossil fuels, reduce energy and transportation burdens on Hawai‘i’s families and invest in actions that make homes stronger, critical infrastructure more resilient and our communities healthier.

The total cost of resilience measures identified in this CAP is estimated at \$1 billion over the next 5 years. Multiple analyses agree that investing in resilience saves money and avoids significant losses. The National Institute of Building Sciences reported in 2019 that building, infrastructure, transportation and utility adaptations that address flooding, hurricanes, earthquakes, and fires can save anywhere from \$4 to \$11 per \$1 invested,²⁷ whereas FEMA estimates that every \$1 spent on disaster resilience efforts saves \$6 in long term costs.²⁸

Savings from these investments for both GHG reduction and resilience will continue past the calculated 2045 timeline. Even so finding the funds to implement the measures described here is a monumental challenge. Meeting this challenge requires a diversified funding strategy that integrates state investments, federal support, and private capital. A challenge that has been increasingly difficult as the funding landscape has changed dramatically since the new federal administration took office. While the state has made meaningful progress through existing budgets and innovative funding legislation, the estimated \$34.9 billion required for a clean and resilient transition will demand more advanced and coordinated action.

CCMC has identified 352 priority projects needed statewide across all sectors, from agriculture to waste management, to advance climate mitigation and adaptation. Together, these projects represent an estimated \$2.5 billion in investment. While not exhaustive, this list provides us with

²⁶ The financial calculations presented in this report are representative and are not an in-depth exploration of all capital, operations, and maintenance costs and savings associated with each measure. These are simplified calculations for the purposes of demonstration.

²⁷ Multi-Hazard Mitigation Council (2019.). *Natural Hazard Mitigation Saves: 2019 Report*. Principal Investigator Porter, K.; Co-Principal Investigators Dash, N., Huyck, C., Santos, J., Scawthorn, C.; Investigators: Eguchi, M., Eguchi, R., Ghosh, S., Isteita, M., Mickey, K., Rashed, T., Reeder, A.; Schneider, P.; and Yuan, J., Directors, MMC. Investigator Intern: Cohen-Porter, A. National Institute of Building Sciences. Washington, DC. www.nibs.org

²⁸ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

a healthy starting point on the pathway to a healthy, affordable resilient climate future. The projects reflect needs identified by managing agencies and community partners and is drawn from agency plans, the State Priority Climate Action Plan (PCAP) submissions, the Grants-to-Project Bridge, and Hawai‘i Department of Transportation’s (HDOT) priority project lists. The vast majority of projects, 274, totaling approximately \$1.98 billion, are HDOT initiatives, including multimodal networks, intersection and transit upgrades, sidewalks, safety improvements, electric vehicle infrastructure, and safe routes to school projects. Restoration projects represent the second-largest category, with 60 projects requiring an estimated \$448.2 million. Community adaptation and resilience needs are the third-largest category, with 14 projects totaling approximately \$225.8 million. These identified projects demonstrate that with funding Hawai‘i is ready to get to work.

Vital federal funding from the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL) enabled critical progress in energy, transportation, waste management, and environmental restoration. Hawai‘i has received over \$1.06 billion dollars of investments from the federal government since the IRA passed, these funds support critical transportation, energy grid, food production, resiliency, and other climate related projects.²⁹ Without these investments, many climate actions would not have been possible.

However, the One Big Beautiful Bill (OBBBA) (2025) paused, rescinded, and canceled much of that funding. In addition, major federal staffing layoffs in 2025 have left state agencies without support and stalled progression of federally funded projects. Nearly all agencies that support climate change action are now understaffed, underfunded and overwhelmed. Essential programs and the funding that comes with them from the Department of Energy, US Department of the Interior (DOI) Federal Emergency Management Agency (FEMA), the National Science Foundation, Housing and Urban Development and the Environmental Protection Agency and many others have been abolished and grants put under review. State advocates estimate \$10.2 billion in grants was available to states through the IRA. Upon passage of the latest federal budget 37 programs have had their unobligated balances rescinded pulling back \$67.9 billion no longer available for climate change related projects, \$59.9 billion of which states were eligible for. While the full impact on Hawai‘i is still emerging, at least \$311 million in federal support has already been lost, including \$62.5 million from Solar for All and \$249 million from the Carbon Smart Commodities Program. States have been vigilant to push back on these actions with thousands of legal actions taken against the federal government. While States have succeeded in preserving obligated funding non-obligated and future federal funding opportunities are not guaranteed and look uncertain. This loss of federal investment will slow Hawai‘i’s progress toward meeting its climate goals and limit the state’s ability to advance critical mitigation and resilience projects.

OBBBA also eliminates or accelerates the phase-out of major climate-related tax credits, including incentives for electric vehicles, residential clean-energy systems, and home-energy-efficiency upgrades. This rollback removes critical support for families to afford energy-saving improvements, leading to lower energy bills and more comfortable homes. Eliminating these credits will result in higher costs for families, businesses, and schools, potentially leading to a 7%

²⁹ Center for American Progress (2025) Congressional Republicans’ Plan to Cut Clean Energy Investments Would Cause Higher Energy Bills and Job Losses Across States <https://www.americanprogress.org/article/congressional-republicans-plan-to-cut-clean-energy-investments-would-cause-higher-energy-bills-and-job-losses-across-states/>

increase in energy costs by 2026.³⁰ Low-income and minority households are particularly vulnerable, as they already face higher pollution burdens and disinvestment. These cuts also remove incentives that supported large-scale renewable energy and power-generation projects eroding energy security opportunities.

If the State is going to be able to offset at least some of the loss of federal funding Hawai‘i must lean into public/private investments such as green bonds, innovative funding streams such as carbon pricing, cost saving solutions such as insurance protections, low-cost solutions such as extended producer responsibilities and parking cash out and philanthropic engagement. By stepping into these innovative spaces and building partnerships with foundations, corporate stakeholders, high-net-worth individuals, and the insurance sector, the State can tap into underutilized sources of investment.

Local Partnerships

One perhaps silver lining of the federal landscape is that it has encouraged Hawai‘i to look inward. The State has been engaged in a series of conversations with local partners, including the Hawai‘i Alliance of Nonprofit Organizations (HANO), the Funder Hui, and Conservation International to assess on-the-ground needs and explore potential solutions. These efforts have helped identify a range of possible strategies for addressing funding gaps such as legislative advocacy, capacity-building partnerships, and more sustainable funding mechanisms independent of federal sources. Shifting the economic paradigm to a circular and wellbeing economy also forms a key pillar of Hawai‘i’s transition to a Climate Resilient Economy. This involves orienting the economy to greater resilience and security and closing the loops of materials and resources to circulate and generate more value and meet people’s needs, whilst generating less waste.

State Investments

The State is actively investing in climate change mitigation and adaptation through various funding mechanisms, including general fund allocations, tax revenues, general obligation bond financing, and Hawai‘i’s own green bank. The Hawai‘i Green Infrastructure Authority (HGIA) operates as Hawai‘i’s Green Bank, a state administered clean energy financing authority created to accelerate Hawai‘i’s transition to clean energy, mitigate climate change and ensure equity in renewable and energy efficiency projects. HGIA facilitates support for underserved communities, advances in Hawai‘i’s energy goals, and specific financing pathways for homeowners, renters, nonprofits and small business to reduce financial barriers through programs such as the Green Energy Money Saver (GEM\$) program.

State Capital Improvement Program funds provide funding for important infrastructure projects such as, watershed fences, wildfire prevention, renewable energy and energy efficiency infrastructure, state fleet electrification, flooding and shoreline protection and waste diversion

³⁰ Jacobson, Rachel and Mikaela Tajo. (June 10, 2025). Center on Budget and Policy Priorities. *Cuts to Climate, Energy Funding in House Bill Would Mean Higher Costs, Fewer Jobs, Poorer Health* <https://www.cbpp.org/research/climate-change/cuts-to-climate-energy-funding-in-house-bill-would-mean-higher-costs-fewer>

infrastructure. State general allocations provide funding for staffing, operations and funding for programs that support climate action. State grant programs such as the Legacy Land Conservation Program which provides funds to preserve lands, the Watershed Partnerships Program that provides funding for watershed protection and the Hawai'i Invasive Species Council that provides grants for biosecurity.

The Climate Impact Fee, also known as the “Green Fee”, on visitor accommodations, Act 96 (2025)³¹ will provide an estimated \$100 million in revenue annually. Funding will be allocated to environmental stewardship, hazard mitigation and infrastructure resilience and visitor experience. The first of its kind in the country the funding still leaves a significant gap in what is needed. In fact, the project list above is not inclusive of the 621 project ideas submitted to the Green Fee Advisory Team requesting over \$2 billion in funding.

Public-Private Partnerships

Public-private partnerships can further advance priority needs by leveraging private-sector resources, expertise, and risk-sharing to speed implementation and reduce the burden on state and county budgets. For example, Hawai'i's estimated \$5 billion statewide cesspool conversion effort, one of the greatest and most urgent climate-related infrastructure challenges, could be supported through a combination of public incentives, low-cost financing, and private capital to expand access to wastewater technologies and scale deployment. Similarly, blended financing can help advance projects such as clean transportation networks, watershed restoration, and climate-resilient housing. Ensuring that limited public funds unlock larger pools of private investment, shorten timelines, and drive coordinated progress toward a cleaner, safer, and more resilient Hawai'i.

Hawai'i is well-positioned to leverage green bonds as a financing tool to support its climate priorities, including resilience, clean energy, ecosystem restoration, and decarbonization. Green bonds are financing instruments that raise capital specifically for projects with verified environmental benefits, such as renewable energy, resilient infrastructure, or pollution reduction. Hawai'i has an established public finance system and a strong credit rating, which supports investor confidence. Projects that qualify typically include renewable energy expansion, energy efficiency upgrades, forest and watershed restoration, coastal resilience, wastewater improvements, transportation electrification, and climate adaptation infrastructure.

Many of Hawai'i's climate initiatives already meet or closely align with required criteria, meaning the state can credibly label them as green investments. Tools such as green bonds can mobilize large-scale private investment for projects with clear environmental benefits, including renewable energy development, coastal resilience, and critical infrastructure upgrades. Green bonds offer Hawai'i several advantages. First, they can unlock large-scale capital for climate work without depending solely on annual appropriations or competitive grants. Investor demand for green bonds is high, often exceeding supply, which can result in favorable pricing and broader investor diversification. Second, issuing green bonds helps the state signal climate leadership, aligning financial policy with statutory mandates. Third, green bond frameworks can improve project

³¹ Act 96, Session Laws of Hawai'i 2025. https://data.capitol.Hawai'i.gov/sessions/session2025/bills/SB1396_.HTM

tracking, transparency, and accountability benefits that enhance public trust and strengthen long-term climate planning. Given Hawai‘i’s urgent adaptation needs and ambitious decarbonization timeline, green bonds represent a powerful, scalable mechanism to finance climate resilience, protect natural resources, and accelerate the state’s transition to a sustainable future.

Partnerships with the insurance sector can play a meaningful role in Hawai‘i’s climate financing strategy. New insurance tools, such as fast-payout disaster policies and catastrophe bonds, can help the State access funds quickly after major events, reducing pressure on public budgets and speeding community recovery. Insurers can also partner with the State to expand premium discounts for homeowners who complete wind, flood, or wildfire upgrades, turning resilience measures into real savings for local families. Strengthening county participation in FEMA’s Community Rating System (CRS) offers another path to lower flood insurance costs, especially for low- and moderate-income households. The sector’s risk-modeling expertise can help the State target investments where they will prevent the most damage. Finally, collaborating on options like targeted premium assistance or a narrowly scoped last-resort coverage mechanism could help stabilize insurance availability for communities most affected by climate change.

Private Investments

Private sector and philanthropic investment play a growing but still limited role in climate funding for Hawai‘i. While over 150 foundation grants have been identified as potential funding sources for Hawai‘i-based, climate related projects, most of these are small in scope, short in duration, and require significant administrative effort to secure and manage. As federal funds decrease, competition for these smaller grants will intensify, further straining already limited state and nonprofit staff capacity.

There is a growing opportunity, and need, for strategic engagement with the private sector, including:

- **Philanthropic Foundations:** Hawai‘i is home to few foundations compared to the continent, and those that operate here cannot meet the scale of need alone.
- **Corporate Contributions and Collaborations:** Partnerships with corporations is vital in achieving our climate goals. Working with airlines and the hotel industry is critical in reducing waste and emissions. Cooperation with Hawaiian Electric to build out utility scale renewable energy projects is integral in a clean energy transition. Expanding the role of the private sector—through green bonds, public-private partnerships, and climate-aligned investment funds—can unlock new capital for renewable energy, resilient infrastructure, and carbon sequestration projects. However, contemporary policy and regulatory barriers, such as uncertainty around tariffs on clean energy technologies, can discourage private investment and stall progress. Overcoming these obstacles will be key in reaching clean economy targets.
- **High-Net-Worth Individuals:** Hawai‘i is home to and visited by some of the nation’s wealthiest individuals, including Jeff Bezos, Larry Ellison, Oprah Winfrey, and Mark Zuckerberg. These individuals have made notable philanthropic contributions, such as the \$100 million donation to Maui wildfire recovery. Sustained relationships with these donors remain a challenge without dedicated outreach and engagement infrastructure.

- **Insurance Sector Partnerships:** With insurance rates tripling for some residents and others being told their homes are uninsurable the need to explore climate resilience partnerships with insurance providers is high. Investing in resilience reduces the risk of costly disaster-related payouts, aligning the interests of both insurers and the state.

Bridging the Gap with Carbon Pricing

Carbon pricing aligns climate goals with budgetary needs and can bridge the gap for both financing and reducing GHG emissions. While Hawai‘i has made strides in renewable electricity, the transportation and industrial sectors remain heavily reliant on imported fossil fuels. Hawai‘i currently levies a “barrel tax” of \$1.05 per barrel on petroleum products. This collection of the “environmental response tax” amounted to \$27.3 million in FY 2024.³² Originally designed for oil spill response, some funding is utilized for the State’s energy transition. However this fee is too low, approx. 2.5 cents per gallon of gas, to influence behavior or drive decarbonization.

To close this gap, the Climate Action Plan proposes utilizing barrel tax to reflect the Social Cost of Carbon (SCC).³³ This transition will be:

1. Incremental: Starting at a low rate (approx. \$0.05/gallon yearly increase) in 2028 and gradually ramping to reach approx. \$0.50/gallon in 2045. This gives businesses and families time to transition to electric vehicles and efficiency measures.
2. Revenue Neutral for LMI households (Carbon Cashback): The state will redistribute funds to those most in need.
3. Progressive: Economic modeling by UHERO confirms that because visitors pay a large share of the tax (~30%) but do not receive the dividend, low- and middle-income families, will receive more in dividends than they pay in increased costs.³⁴
4. Effective: This price signal is projected to reduce cumulative emissions by an additional 10% by 2045, capturing abatement opportunities that regulations miss.

By asking the market to tell the truth about the cost of carbon, Hawai‘i can export the tax burden to tourists, protect local families, and close the funding gap to accelerate our journey to a clean energy future.

Hawai‘i’s path to a climate-resilient future is clear, but without significant and sustained investment, it remains out of reach. The state cannot shoulder this burden alone. Federal funding must be stabilized and expanded to support long-term planning and project implementation. Private and philanthropic sectors must be engaged more deeply and strategically. High-net-worth individuals with ties to Hawai‘i represent a powerful, underutilized opportunity for transformative investment.

³² Department of Taxation. Annual Report 2023-2024: [https://files.Hawai‘i.gov/tax/stats/stats/annual/24annrpt_2.pdf](https://files.Hawai'i.gov/tax/stats/stats/annual/24annrpt_2.pdf)

³³ The Social Cost of Carbon is a comprehensive estimate of climate change impacts in net agricultural productivity, human health, property damages from increased flood risk, and changes in energy system costs. See the EPA’s definition at: https://19january2017snapshot.epa.gov/climatechange/social-cost-carbon_.html

³⁴ UHERO (2021) ‘Carbon Pricing Assessment for Hawai‘i Economic and Greenhouse Gas Impacts’, [https://energy.Hawai‘i.gov/wp-content/uploads/2021/04/Hawai‘iCarbonPricingStudy_Final_Apr2021.pdf](https://energy.Hawai'i.gov/wp-content/uploads/2021/04/Hawai'iCarbonPricingStudy_Final_Apr2021.pdf)

Funding the Resilience Recommendations:

The following recommendations are consistent with the Governor’s Hawai‘i Climate Advisory Team’s (CAT) findings in their recent report “Policy Recommendations on Climate Disaster Resilience, Recovery and Funding”.³⁵ The costs associated with these measures are based on the findings of that report as well.

Increase and Expand the Climate Impact Fee. Increase the climate impact fee established by Act 96 (2025) and expand its mandate to support community and infrastructure resilience, including native ecosystems, with appropriate safeguards for transparency and equity. Preliminary analyses suggest needs could range from the hundreds of millions to over a billion dollars over the next several years; set a clear revenue path and oversight structure commensurate with that scale.

Establish a Permanent Hawai‘i Climate Change Office. Create a permanent Hawai‘i Climate Change Office (HCCO) to coordinate mitigation and adaptation across agencies and counties, manage climate funding, track performance, and ensure equity and accountability. COST: \$15 million over 5 years for staffing, operations, and program management capacity.

Establish a Hawai‘i Climate Resilience Fund (HCRF) and a Hawai‘i Disaster Recovery Fund (HDRF). The HCRF would provide a dedicated, long-term financing mechanism for implementing the State’s priority resilience actions to harden homes against natural disaster as outlined in the buildings chapter. The HDRF would provide rapid relief following a disaster to those most exposed to harm. The CAT recommends at least \$375 million to be dedicated annually to these funds to resource resilience measures at the scale needed to meaningfully reduce statewide climate risk.

³⁵ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*.



4. Coordination and Outreach

The development of the Climate Action Pathways (CAP) has been a collaborative effort which has been co-designed with the participation of numerous individuals across one hundred different State agencies, county departments, and distinct non-profit organizations (a list of these can be found in the Acknowledgements section above).

4.1 Interagency and Intergovernmental Coordination

One key site of this collaborative effort has been the sectoral Technical Working Groups (TWG) which began meeting in 2023. The Working Groups were comprised of State and County employees, as well as University researchers and non-profit organizations, all with expertise in sector focus areas. TWGs identified additional research needs, barriers to implementation, policy needs and measure recommendations.

The 15 TWG sectors were:

- Decarbonization EV (Transportation)
- Decarbonization VMT and Land Use
- Alternative Fuels (Transportation)
- Decarbonization of Aviation (Transportation)
- Electricity and Combustion Decarbonization

- Farming, Ranching, Food System Decarbonization
- Forestry
- Decarbonization of IPPU (Industrial Processes and Product Use)
- Marine Transportation
- Wetlands
- Waste and Material Management
- Urban Forestry
- Buy Green
- Wastewater
- Buildings Energy Efficiency

In tandem with the TWGs, a statewide hui (working group) has been working since April 2023 to review the TGW recommendations and identify priority measures across the state, counties, and in the nonprofit sector. Hui members represent the Departments of Education, Agriculture, Land and Natural Resources, Transportation, Health, Business, Tourism and Economic Development, Hawai'i Emergency Management Agency, the County of Maui, the County of Hawai'i, the County of Kaua'i, and the City and County of Honolulu, and other state, county, university, and non-governmental agencies.

4.2 Outreach and Equity Groups

Outreach Plan:

The Outreach Plan for this work was developed in collaboration with the counties and largely taken from existing and proven county outreach strategies. The Outreach Plan emphasizes a nuanced, inclusive, and culturally tailored approach to engage all residents, with emphasis on reaching Native Hawaiians, minorities, low-income, and historically marginalized communities, across every island. Recognizing the distinct environmental challenges and historical impacts of colonization, the strategy blends physical methods like pop-up events, local community and neighborhood events, Community Based Organization events, film events, focus groups, and direct engagement with kūpuna (elders) and youth, alongside digital tactics such as robust social media campaigns, e-newsletters, and accessible online platforms. By focusing on understanding unique community dynamics, fostering trust through transparent processes, and integrating traditional knowledge, the plan aims to empower residents to actively shape climate actions that are truly relevant and sustainable for Hawai‘i.

To maximize participation and ensure equitable representation, our outreach strategy will seek to prioritize compensating organizations and individuals for their time and expertise in climate planning initiatives. Crucially, we must continuously seek innovative ways to engage with youth groups and Native Hawaiian communities, building on their knowledge to inform climate action and resilience measures. Furthermore, we commit to establishing greater alignment and coordination across all state agencies to prevent outreach fatigue in communities and ensure that all stakeholder engagement efforts are cohesive, efficient, and mutually reinforcing.

Outreach, Community Engagement and Stakeholder Input:

Recognizing that effective climate action requires broad participation and reflects the diverse needs and concerns of all residents, a multi-faceted outreach strategy was developed with various stakeholders and implemented across the Hawaiian Islands. This section details the methodologies employed to gather feedback, highlights the key concerns raised by the community, and underscores the importance of this input in shaping a robust and equitable climate action plan for the state.

Methodology for Community Engagement and Stakeholder Input:

A dedicated outreach team was established to ensure comprehensive coverage across all islands, actively engaging with communities, key stakeholders, and youth organizations. The outreach strategy was designed to be inclusive, accessible, and to provide multiple avenues for residents to learn about climate change and contribute their perspectives to the development of the Climate Action Pathways Plan. The following methodologies were employed:

Community Events and Public Engagement:

A significant component of the outreach effort involved active participation in over 100 diverse community events statewide. These events served as crucial opportunities for direct interaction with residents and included:

- *Film Screenings* (10): Utilizing visual media to raise awareness about climate change impacts and solutions relevant to Hawai‘i, interactive panel discussions followed each film screening.

- *Earth Day Events* (10): Leveraging established community gatherings focused on environmental stewardship to engage a broad audience.
- *Round Table Discussions* (5): Facilitating in-depth conversations with community leaders and residents on specific climate-related challenges and potential solutions, many of these were virtual to gain a wider audience across the islands.
- *School Visits* (7): Engaging with students and educators to foster climate literacy and solicit youth perspectives on the future impacts of climate change.
- *Community Climate Fairs* (3): Hosting dedicated events in various locations across the state, providing information, interactive activities, and opportunities for feedback.
- *Intensive Climate Week* (1): Organizing a concentrated period of events and activities to elevate public awareness and engagement on climate action.
- *Youth Climate Summit* (2): Students engage with legislatures to lend a voice to policy for a better future for Hawai‘i and meet with various organizations working with youth in the sustainability field.
- *Talk Story Sessions* (11): Residents of the community engaged with state climate commission staff to give input toward the CAP.
- *Neighborhood Board Meetings* (10): Residents of the community and the neighborhood boards were informed of the CAP process and how they were able to provide input.
- *Other Events* (45+): Attended and tabled at numerous organizational events, such as non-profits or other governmental agencies and events being held.

At each of these events, outreach staff actively engaged with attendees, providing information, answering questions, and facilitating feedback collection.

Educational Resources and Materials:

A detailed educational poster was developed and widely disseminated both physically at events and digitally online. This resource aimed to:

- Clearly outline the key impacts of climate change on the State of Hawai‘i, utilizing accessible language and visuals.
- Highlight the specific ways in which these impacts affect the daily lives of Hawai‘i residents.
- Showcase current climate change initiatives being undertaken by county and state governments.
- Provide actionable steps that individuals can take to reduce their carbon footprint and contribute to climate solutions.

The online availability of the poster ensured that this crucial information reached a wider audience beyond event attendees.

Figure 3: Hawai'i Climate Action Poster

Feedback Collection Mechanisms:

Multiple methods were employed to ensure that all residents had the opportunity to contribute their concerns and ideas to the Climate Action Plan:

- *Field Notes:* Outreach staff meticulously documented key themes and concerns raised during direct conversations at community events.
- *Provided Forms:* Physical forms were made available at all events, allowing residents to document their specific concerns in a structured manner.
- *Online Feedback Form:* Two dedicated online platforms were created to provide a continuous avenue for feedback submission, accessible to all residents at their convenience.

These diverse collection methods ensured that feedback was captured from a wide range of individuals and in various formats.

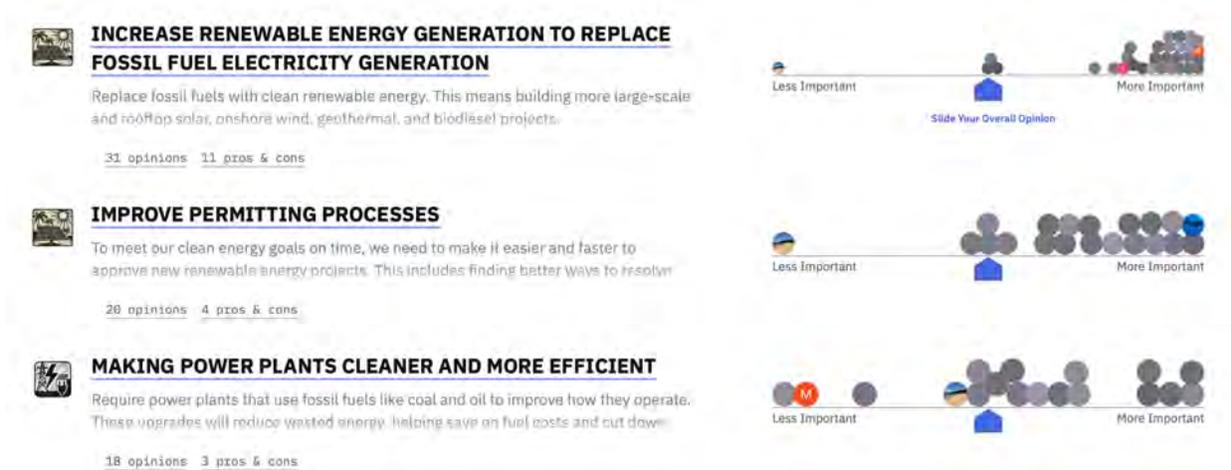


Figure 4: Feedback from Online platform on draft version of CAP

Online Communication and Engagement:

Recognizing the importance of digital platforms for information dissemination and community building, the following online tools were utilized:

- *Statewide Climate, Conservation, and Sustainability Events Calendar*: An online calendar was developed and maintained to centralize information about relevant events across the state. This has proven to be a valuable resource for residents seeking to engage in climate-related activities.
- *Monthly Newsletter*: A newsletter providing updates on climate action efforts, relevant news, green jobs that were available and opportunities for engagement was distributed to approximately 2,200 subscribers statewide, receiving positive feedback for its informative content.
- *Weekly Social Media Engagement*: Consistent weekly posts were used to share information, promote events, and engage in online conversations about climate action. This engagement on Instagram (approximately 2,100 followers) reached 6,624 accounts over a 30-day period, and Facebook (approximately 900 followers) had 1,025 views over the same period.
- *Direct Constituent Communication*: Weekly calls and emails were conducted with constituents on Kaua‘i, Hawai‘i Island, Maui Nui, and Oahu to provide updates and solicit feedback.

Strategic Partnerships:

Collaborations were actively fostered with key community-based organizations and Native Hawaiian organizations. These partnerships were crucial in:

- Reaching marginalized and underserved communities to ensure their unique vulnerabilities and perspectives were integrated into the Climate Action Plan.
- Leveraging existing community networks and trusted relationships to build trust and encourage participation.

Youth Engagement:

Recognizing the critical role of future generations in climate action, specific efforts were made to engage young people:

- *School Presentations:* Outreach staff conducted presentations in schools to educate students about climate change and its impacts.
- *Youth Climate Summit:* A yearly dedicated summit was organized at the state capitol to provide a platform for youth voices and perspectives on climate action with lawmakers.
- *Youth Engagement Webpage:* An online resource was created listing organizations that work with youth in the climate sector, providing plans for ongoing engagement.

Climate Action Artists Residency:

An innovative Climate Action Artists Residency program was developed to integrate creative perspectives into the planning process. Selected artists participated in focus groups to deepen their understanding of climate change impacts in Hawai‘i and will subsequently develop artwork that reflects these issues, fostering broader public engagement through artistic expression.

Through these diverse and interconnected methodologies, a robust framework for community engagement and stakeholder input was established, ensuring that the development of the State of Hawai‘i Climate Action Plan is informed by the experiences, concerns, and aspirations of the people it serves.

4.3 Top Community Concerns for the Climate Action Plan

The extensive outreach efforts conducted during 2024 and 2025 included 3,000 active engagements with over 7,000 attendees at 100+ events, yielded a wealth of valuable feedback, with over 900 individual concerns documented. The analysis of this feedback has identified the following top 10 concerns raised by the community, highlighting the key areas of focus for the State of Hawai‘i Climate Action Plan:

Community Feedback on Climate Change concerns

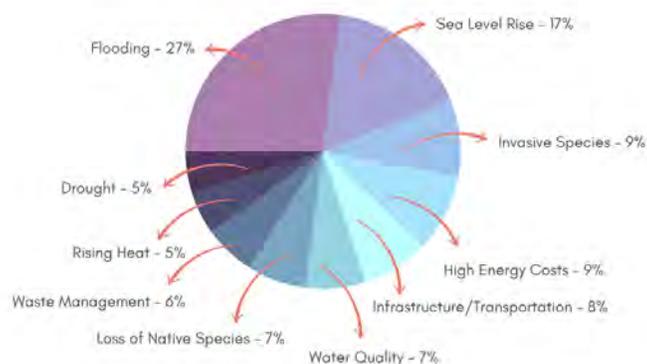


Figure 5: Community Feedback on Climate Change Concerns.

This list clearly indicates the most pressing climate-related concerns for the residents of Hawai‘i. Flooding emerged as the most frequently mentioned concern, highlighting the increasing vulnerability of communities to extreme weather events. Sea Level Rise and Coastal Erosion also ranked highly, reflecting the direct threat to coastal communities, infrastructure, and ecosystems. The significant concern regarding Invasive Species underscores the interconnectedness of climate change with other environmental challenges facing the islands. High Energy Costs are a persistent issue for residents and are directly linked to the state's reliance on fossil fuels, emphasizing the need for a transition to renewable energy sources.

The concerns regarding Lack of Transportation/Infrastructure and Water Quality/Runoff point to the need for resilient and sustainable infrastructure development. The Loss of Native Species/Ecosystems/Forests highlights the importance of protecting Hawai‘i's unique biodiversity in the face of climate change.

Issues related to Waste Management/Pollution, Heat/Rising Temperatures, and Lack of Water/Drought further emphasize the multifaceted impacts of climate change on daily life and natural resources.

The other concerns that were shared, while mentioned less frequently, are nonetheless important and reflect specific vulnerabilities and challenges facing different communities and sectors across the state. These include Agricultural Issues, Cesspools/Wastewater Management, Lack of Emergency Preparedness, Military Impacts, Housing/Affordability, Healthcare Access, Plant/Bird Extinction, and the potential for increased Hurricanes. Concerns about Tourism Impacts and Lack of Government Action/Accountability signal the community's desire for responsible and effective climate governance.

This comprehensive list of concerns will serve as a critical foundation for the development of targeted strategies and actions within the State of Hawai‘i Climate Action Plan. Addressing these priorities, as articulated by the community, will be essential for creating a plan that is effective, equitable, and reflects the lived experiences of Hawai‘i residents.

Direct Stakeholder Engagement on Climate Equity:

In addition to these extensive public outreach efforts, a parallel effort was carried out to gather in-depth stakeholder input on issues of climate equity through a targeted engagement process. This effort was designed to elevate the voices of those working directly in or affected by climate equity challenges across Hawai‘i. The process involved one-on-one meetings with key stakeholders from across the climate change and resilience landscape, including researchers, nonprofits, community-based organizations (CBOs), and public agencies.

Over the course of these engagements, qualitative interviews and informal discussions were conducted with a wide array of participants. These conversations focused on understanding the equity concerns observed in their work, identifying needs and gaps, surfacing community-driven solutions, and collecting recommendations for what the State can do to support equitable climate resilience. The result was a robust set of feedback, totaling 101 unique stakeholder comments. These comments were analyzed and grouped by category to identify common themes and priorities.

A quantitative breakdown of these comments revealed key areas of concern, with the number of comments indicated in brackets ():

- **Equity and marginalized communities** (21 mentions): Emphasizing distributional equity, access for underrepresented populations such as Native Hawaiians, Micronesian and Pacific Islanders, and low-income households.
- **Funding and financial support** (19): Including suggestions on grant access, utility bill relief, and new funding mechanisms.
- **Workforce development** (12): Highlighting equitable access to job training, certification programs, and green economy pathways.
- **Community engagement and participation** (12): Calling for more inclusive planning, better outreach coordination, and compensated community involvement.
- **Infrastructure and transportation** (11): Including safe transit systems, climate-resilient design, and accessibility improvements.
- **Renewable energy, water management, education, land use, and disaster resilience** were also notable themes, each receiving between 6 and 9 mentions.

This analysis underscores the depth and diversity of climate equity concerns across Hawai‘i. Key takeaways include the urgent need for better funding systems, inclusive and coordinated planning processes, workforce pipelines for underrepresented communities, and enhanced community ownership in climate initiatives. These insights form a critical backbone to our state’s Climate Action Pathways and should guide both policy and implementation.

Climate Equity Hui: A Collaborative Working Group

Complementing the direct interviews, we convened a recurring working group referred to as the Climate Equity Hui, bringing together diverse stakeholders from CBOs, researchers, Native Hawaiian organizations, and public agencies to collaboratively explore equity challenges in climate resilience. This Hui meets bimonthly to hold space for cross-sector dialogue, exchange best practices, and collectively develop actionable recommendations for the state.

Hui members collectively developed a shared working definition of climate equity, which was used to inform this CAP’s equity framework. The definition is as follows:

Climate equity is the process of ensuring that Hawai‘i’s climate change responses prioritize and uplift disadvantaged communities, particularly those most burdened by the effects of climate change as well as colonialism and historical inequities. Mitigation and adaptation strategies should incorporate traditional, place-based Native Hawaiian knowledge, provide equitable access to resources, and prevent future inequities through systemic change. This process must also ensure that the economic benefits of transitioning to a climate-smart economy are shared among all residents, particularly vulnerable and historically marginalized communities.

A topic of interest that arose organically during discussions was for the Hui to explore mechanisms to strengthen community-led resilience planning, including improved coordination among

agencies, equitable funding pathways, and strategies to support local leadership. Discussing various pathways to achieve this became a focus for meeting discussions.

Key recommendations that have emerged from the Climate Equity Hui to date include:

- “Resilience hubs” (community-serving facilities that provide daily services and become centralized support centers during disasters) could potentially serve as centers of empowerment for community planning and engagement. The state should help develop and support resilience hubs through funding, technical assistance (TA), and partnerships with local CBOs.
- More coordination around state outreach and community engagement efforts and tracking mechanisms to support this effort. A potential solution is to create an entity or staff position to track and coordinate community plans and outreach efforts, ensuring efforts build on each other and prevent community fatigue.
- Improve equity in state funding by updating NOFA/RFP language and providing pre-application support for CBOs.
- Increase state-level TA opportunities for resilience planning and funding applications, as most current TA opportunities are federal and don’t effectively navigate the state landscape
- Compensate community members and ensure their priorities are addressed in implementation.
- Center food security, place-based education, and Indigenous knowledge as pillars of climate resilience.

Through these sustained conversations and partnerships, the Climate Equity Hui has helped build a shared understanding of equity challenges and has co-developed early strategies for moving from planning to action. These efforts are helping to build a more inclusive, resilient, and just climate future for Hawai‘i.

The findings and recommendations generated through both individual engagements and the Hui will be carried forward as a foundational component of this Climate Action Plan and should inform future phases of implementation and monitoring.

Engagement Metrics (2023-2025)	Results
<i>Number of outreach meetings or events</i>	100+
<i>Number of Engagements at Outreach Events</i>	3000+
<i>Number of advisory groups and number of members in these groups</i>	
1. <i>Energy</i>	11
2. <i>Commercial and Residential Buildings</i>	14
3. <i>Transport</i>	26
4. <i>Industry</i>	8
5. <i>Buy Green</i>	17
6. <i>Agriculture, Forestry and Other Land Uses</i>	31
7. <i>Waste</i>	17
8. <i>Circular and Wellbeing Economy</i>	18
9. <i>LIDAC and Workforce Development</i>	22
<i>Number of survey respondents</i>	400
<i>Number Feedback Comments received for CAP</i>	900+
<i>Number of newsletter subscribers</i>	2200+
<i>Number of Social Media Followers</i>	3000+

Table 2: Engagement Metrics for Development of CAP 2023-2025

Integrating Community Voices into Climate Action:

The extensive outreach and engagement efforts undertaken have been instrumental in gathering valuable insights and concerns from communities, stakeholders, and youth across the State of Hawai‘i. The methodologies employed were designed to be inclusive and accessible, ensuring a broad representation of voices in the development of the Climate Action Plan. The identification of the top 10 community concerns provides a clear roadmap for prioritizing key areas of action. Issues such as flooding, sea level rise, invasive species, and high energy costs demand immediate and focused attention. The diverse range of other concerns, from water quality to healthcare access, underscores the interconnectedness of climate change with various aspects of life in Hawai‘i.

The feedback received through this outreach process is not merely a list of concerns; it represents the lived experiences, vulnerabilities, and priorities of the people of Hawai‘i. Integrating these voices into the State's Climate Action Plan is paramount to ensuring its relevance, effectiveness, and equitable implementation. This chapter highlights the commitment to a community-driven approach, recognizing that a successful climate action plan must be built in partnership with the people it aims to serve. The insights gained will directly inform the development of specific goals, strategies, and actions within the subsequent chapters of this plan, ensuring that the State of Hawai‘i takes meaningful and responsive steps towards a sustainable and resilient future for all.

4.3 County Plans and Outreach

Each of Hawai‘i’s four counties undertook comprehensive community engagement to inform their respective climate action and resilience plans. These efforts emphasized transparency, inclusion, and public participation in shaping local climate strategies.

County of Hawai‘i - Hawai‘i County’s planning process began with three climate workshops in 2021, supported by a Climate Action Working Group composed of community members. The County’s Climate Action Team (CAT) partnered with this group to create and distribute a climate sentiment survey, collecting 1,079 responses between September 2021 and March 2022. Survey distribution was extensive, leveraging government networks, media, and local organizations such as UH Hilo, Hawaiian Electric, and Zero Waste Hawai‘i. The survey helped shape the draft Climate Action Plan by identifying key community concerns and co-benefits for climate actions.³⁶

County of Maui - Maui’s Climate Action and Resilience Plan (CARP) is currently under review.

City and County of Honolulu - Honolulu integrated over 2,000 community perspectives into its Climate Action Plan (CAP) through three phases: 11 public meetings (672 participants), a representative island-wide survey (760 respondents), and a virtual open house (614 participants). Early events featured interactive climate games, and a stakeholder working group refined strategies and technical inputs. The survey results revealed strong climate concern among residents and informed priorities and baseline assumptions for the CAP.³⁷

County of Kaua‘i - From 2022 to 2025, Kaua‘i’s KCAAP outreach included a technical advisory group, stakeholder interviews, talk-stories, and open houses, followed by deep-dive workshops organized by planning districts (held both virtually and in person). Additional engagement included regional meetings with Native Hawaiian practitioners and hotel operators, a Youth Climate Summit, and ongoing community outreach through pop-up events, classroom activities, social media, storybanks, listservs, radio, surveys, and polls. In 2023, the County hosted in-person and virtual workshops to gather feedback on potential greenhouse gas reduction strategies. These included open houses, presentations, live polling (via Menti), and Q&A sessions. Community input helped refine and prioritize strategies in the draft KCAAP. An online survey using the “Consider.It” platform collected 608 opinions on proposed strategies and feedback on six new community-suggested actions.³⁸

This cross-county engagement model illustrates the importance of local knowledge and community partnership in shaping equitable and effective climate policies across the state.

³⁶ County of Hawai‘i Planning Department (2023). Integrated Climate Action Plan for the Island of Hawai‘i:

³⁷ City & County of Honolulu (n.d.) One Climate One O‘ahu Climate Action Plan 2020-2025, <https://static1.squarespace.com/static/5e3885654a153a6ef84e6c9c/t/6080c33e91bbf23a20b74159/1619051381131/2020-2025+Climate+Action+Plan.pdf>

³⁸ County of Kaua‘i (2023). Kaua‘i Climate Adaptation and Action Plan

4.4 Towards A Healthy Climate Information Ecosystem

Outreach with the community in Hawai‘i and opening channels for input into the State’s planning process is part of a healthy, transparent and responsive democracy where people have the power and opportunity to shape the actions being proposed by the government. At the same time, the health of this dynamic of participatory governance relies on the health of a broader system of education and information access surrounding climate change.

In national surveys Hawai‘i consistently ranks as one of the US states with the highest levels of awareness of and concern about climate change and where demands for climate action are amongst top priorities. With that said, national trends in the US also show that a minority of people believe that climate change either does not exist (14%), or is only partially caused by human actions (29%).³⁹ In reviewing the public feedback for this CAP and engaging with the community, the CCMAC team encountered a very small percentage of people who would fall in one of the above categories of climate sceptics or climate deniers.

It is important to understand that such denial and skepticism is not the result of idiosyncratic individual beliefs but the consequence of a deliberate effort by powerful organizations associated with the fossil fuel industry over several decades to muddy the waters of information around climate change and prevent action being taken against their interests.⁴⁰ This systematic deception fundamentally undermines the public mandate required for ambitious state-level climate action, posing a direct threat to the goals established by the State of Hawai‘i.

Evidence reveals that major fossil fuel companies intentionally developed and deployed campaigns of deception and disinformation for decades, knowing their products caused harm to the planet and public.^{41, 42} The Attorney General in Hawai‘i has filed a suit against a number of major fossil fuel companies considering decades-long campaigns of disinformation.⁴³

Governor Green, addressing the rising costs associated with climate change stated in a press release following the filing of the suit in May 2025: “Hawai‘i taxpayers should not have to foot that bill.

³⁹ Yale Program on Climate Change Communication (YPCCC). *Yale Climate Opinion Maps, US Public Opinion Estimates, 2024*. Available: <https://climatecommunication.yale.edu/visualizations-data/ycom-us/>. (Accessed October 2025).

⁴⁰ Union of Concerned Scientists (UCS). “Climate Deception Dossiers.” *UCS Resource Center*. Available: <https://www.ucs.org/resources/climate-deception-dossiers>. (Accessed October 2025).

⁴¹ Carrington, Damian. “Climate misinformation turning crisis into catastrophe”. *The Guardian*. June 19, 2025. Available: <https://www.theguardian.com/environment/2025/jun/19/climate-misinformation-turning-crisis-into-catastrophe-ipie-report>. (Accessed October 2025).

⁴² International Panel on the Information Environment (IPIE). *Information Integrity about Climate Science: A Systematic Review (Synthesis Report, SR2025.1)*. Zurich, Switzerland: IPIE, 2025. doi: 10.61452/BTZP3426. Available: <https://www.ipie.info/research/sr2025-1>. (Accessed October 2025).

⁴³ Atto <https://climateintegrity.org/uploads/media/Filed-ICCV-25-0000717.pdf>

The burden should fall on those who deceived and failed to warn consumers about the climate dangers lurking in their products. This lawsuit is about holding those parties accountable, shifting the costs of surviving the climate crisis back where they belong, and protecting Hawai‘i citizens into the future.”⁴⁴

This sustained erosion of consensus around the climate crisis which the fossil fuel industry has funded over several decades diminishes public trust, complicates coordination among regulatory agencies, and directly weakens the political mandate necessary to implement and sustain ambitious climate action plans. The shift to a climate denialist federal administration can also be seen as the direct result of these decades-old efforts by the fossil fuel industry which is not only a significant donor to political campaigns, but also now finds itself in significant administrative positions in the federal government.^{45, 46}

The State of Hawai‘i, our partners in the counties and communities, our education system and the media have a responsibility to ensure that climate disinformation is addressed and that a healthy, empirically based and transparent informational space is nurtured. UN special rapporteur on human rights and climate change, Elisa Morgera, for instance, has made a call to “defossilise” the information systems.⁴⁷

Following from this and doing its part in developing a healthy climate information ecosystem, CCMAC will be publishing a website in 2026 which will focus on climate solutions in the state of Hawai‘i. Highlighting the key climate issues and challenges of each sector also found in this CAP, the website will point to key projects and initiatives being developed across Hawai‘i by the State, counties and community organizations, as well as resources on how to get involved in climate action.

⁴⁴ State of Hawai‘i. “Hawai‘i Condemns Administration’s Illegal Attempt To Interfere With State Lawsuit Against Big Oil”. May 1, 2025, Available: <https://ag.hawaii.gov/wp-content/uploads/2025/05/News-Release-2025-59.pdf?ref=climateinthecourts.com> (Accessed October 2025).

⁴⁵ Zibel, Alan and Rosenthal, Toni Aguilar. “Trump’s Polluter Playground: Fossil Fuel Insiders & Ideologues Prop Up Dirty Energy & Derail Clean Power”. *Public Citizen and the Revolving Door Project*. October 6, 2025. Available: <https://www.citizen.org/article/trumps-polluter-playground/>

⁴⁶ Noor, Dharna. “More than 40 Trump administration picks tied directly to oil, gas and coal, analysis shows” June 19, 2025. *The Guardian*. October 9, 2025. Available: <https://www.theguardian.com/us-news/2025/oct/08/trump-administration-fossil-fuels-climate> (Accessed October 2025).

⁴⁷ Carrington, Damian. “Climate misinformation turning crisis into catastrophe.” June 19, 2025. *The Guardian*. June 19, 2025. Available: <https://www.theguardian.com/environment/2025/jun/19/climate-misinformation-turning-crisis-into-catastrophe-ipie-report> (Accessed October 2025).



5. Greenhouse Gas Emissions Inventory and Emissions Projections

5.1 Greenhouse Gas (GHG) Emissions Inventory

The State of Hawai‘i is committed to reducing its contribution to global climate change and has taken efforts to measure and reduce statewide GHG emissions. In 2007, the State of Hawai‘i passed Act 234, to establish the state’s policy framework and requirements to address GHG emissions. The law sought to achieve emission levels at or below Hawai‘i’s 1990 GHG emissions by January 1, 2020 (excluding emissions from airplanes). In 2008, the State of Hawai‘i developed its first statewide GHG emission inventories for 1990 and 2007. HRS §342B Part VI requires the Hawai‘i Department of Health Clean Air Branch (DOH-CAB) to complete a greenhouse gas emissions inventory report each year beginning after 2017 to track emissions and determine the State’s progress in the reduction of greenhouse gas emissions. The 2025 Hawai‘i Greenhouse Gas Emissions Report presents updated 1990, 2005, 2007, 2010, 2015, 2016, 2017, 2018, 2019, 2020, and 2021 emissions estimates; emissions estimates developed for 2022; and emission projections for 2025, 2030, 2035, 2040, and 2045.⁴⁸

⁴⁸ DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022, April 2025, available from <https://health.hawaii.gov/cab/files/2025/04/Final-2022-GHG-Emissions-Report.pdf>

Based on the analysis presented in the 2025 report, net GHG emissions (excluding aviation) in 2020 are estimated to have been lower than net GHG emissions (excluding aviation) in 1990 meeting the target set by Act 2342. Net GHG emissions (including aviation) in 2030 are projected to be greater than the target emissions level of 50 percent below 2005 levels (including aviation) pursuant to Act 238, and in 2045 are projected to be greater than the target of net-negative levels pursuant to Act 15. While the development of future inventory reports as well as ongoing quantitative assessment of uncertainties will further inform whether Hawai‘i will meet the 2030 and 2045 statewide targets, this report finds that Hawai‘i met the 2020 target, but—given existing policies, anticipated adoption of technologies, and economic expectations—is not expected to meet the 2030 and 2045 targets.

5.2 GHG Methodology

The DOH CAB uses standards from the IPCC to estimate Hawai‘i’s GHG emissions.⁴⁹ The 2006 IPCC Inventory Guidelines are a nationally and internationally recognized standard accepted by the United Nations Framework Convention on Climate Change (UNFCCC) and the US Environmental Protection Agency (EPA).⁵⁰

5.3 GHG Emissions by Sector

Table 3: Hawai‘i GHG Emissions by Sector (Including Sinks and Aviation) below shows GHG emissions by sector (including sinks and aviation) for each inventory year in Hawai‘i. In all inventory years, emissions from the Energy sector accounted for the largest portion (more than 85 percent) of total emissions in Hawai‘i. As the largest source of emissions in Hawai‘i, the Energy sector is a major driver of the overall emissions trends, accounting for 81.4 percent of the emissions increase from 1990 to 2007 and 87.5 percent of reductions between 2007 and 2022. Transportation emissions - which increased between 1990 and 2007 and then decreased through 2022 - accounted for the largest share of Energy sector emissions in all inventory years. Stationary combustion emissions - which similarly increased between 1990 and 2007, before decreasing through 2022 - are the second largest share of Energy sector emissions. This trend is driven by emissions from energy industries (electric power plants and petroleum refineries) as well as industrial and commercial emissions. The decrease in energy emissions is largely due to reduced fuel consumption across all subsectors, which is driven by increased energy efficiency and the growth of renewable energy.

⁴⁹ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization: Act 238, Session Laws of Hawai‘i 2022*. https://energy.hawaii.gov/wp-content/uploads/2024/01/Act_238_HSEO_Decarbonization_Report.pdf

⁵⁰ Intergovernmental Panel on Climate Change (2006). IPCC Guidelines for National Greenhouse Gas Inventories, <https://www.ipcc-nggip.iges.or.jp/public/2006gl/>

Sector/Category	1990	2005	2010	2015	2020	2022	% of 2022
Energy	20.25	22.72	19.38	18.50	14.66	17.95	
Stationary Combustion	8.47	9.56	8.89	8.16	7.29	7.44	41.4%
<i>Energy Industries</i>	6.38	8.33	7.86	7.11	6.48	6.37	85.7%
<i>Residential</i>	0.05	0.07	0.09	0.06	0.06	0.06	0.9%
<i>Commercial</i>	0.76	0.36	0.37	0.47	0.50	0.55	7.4%
<i>Industrial</i>	1.29	0.81	0.56	0.51	0.25	0.45	6.0%
Transportation	11.13	12.58	9.92	9.72	6.96	10.12	56.3%
<i>Ground</i>	3.71	5.04	4.20	4.29	3.13	3.47	34.3%
<i>Domestic Marine</i>	1.53	0.37	0.58	0.28	0.34	0.65	6.4%
<i>Domestic Aviation</i>	3.69	6.13	3.98	4.29	2.73	4.90	48.5%
<i>Military Aviation</i>	1.42	1.03	0.66	0.80	0.45	0.77	7.6%
<i>Military Non-Aviation</i>	0.77	0.02	0.51	0.05	0.32	0.32	3.2%
Incineration of Waste	0.18	0.15	0.19	0.27	0.28	0.26	1.5%
Oil and Natural Gas Systems	0.43	0.39	0.32	0.31	0.10	0.10	0.5%
Non-Energy Uses	0.04	0.04	0.05	0.05	0.04	0.04	0.2%
<i>International Bunker Fuels</i>	1.56	2.23	1.31	1.56	0.69	0.83	4.6%
<i>CO₂ from Wood Biomass and Biofuels Consumption</i>	2.43	1.04	1.24	1.41	1.16	1.19	6.6%
IPPU	0.18	0.50	0.67	0.79	0.76	0.85	
Cement Production	0.10	0.00	0.00	0.00	0.00	0.00	0.0%
Substitution of Ozone Depleting Substances	+	0.46	0.65	0.77	0.75	0.84	98.7%
Electrical Transmission and Distribution	0.08	0.03	0.02	0.01	0.01	0.01	1.3%
AFOLU (Sources)	1.47	1.10	1.08	1.09	1.10	1.11	
Enteric Fermentation	0.35	0.31	0.30	0.26	0.28	0.29	26.2%
Manure Management	0.14	0.05	0.02	0.02	0.01	0.01	0.7%
Agricultural Soil Management	0.16	0.14	0.15	0.14	0.14	0.15	13.0%
Field Burning of Agricultural Residues	0.03	0.03	0.01	0.01	0.00	0.00	0.0%
Urea Application	+	+	+	+	+	+	0.1%
Agricultural Soil Carbon	0.76	0.50	0.57	0.57	0.58	0.58	52.4%
Forest Fires	0.02	0.06	0.03	0.09	0.09	0.08	7.5%
AFOLU (Sinks)	(2.40)	(2.50)	(2.62)	(2.73)	(2.43)	(2.48)	
Landfilled Yard Trimmings and Food Scraps	(0.12)	(0.05)	(0.05)	(0.05)	(0.04)	(0.05)	1.9%
Urban Trees	(0.48)	(0.60)	(0.62)	(0.60)	(0.58)	(0.60)	24.4%
Forest Carbon	(1.79)	(1.86)	(1.95)	(2.07)	(1.80)	(1.83)	73.8%
Waste	1.01	0.98	0.60	0.51	0.41	0.40	
Landfills	0.89	0.84	0.50	0.41	0.32	0.32	79.8%
Composting	0.02	0.03	0.03	0.03	0.04	0.03	6.7%
Wastewater Treatment	0.09	0.11	0.06	0.07	0.05	0.05	13.5%
Total (Without Sinks)	22.90	25.29	21.71	20.88	16.93	20.32	
Net (With Sinks)	20.51	22.78	19.09	18.16	14.50	17.83	
Aviation	5.11	7.16	4.64	5.09	3.17	5.67	
Net (With Sinks, Without Aviation)	15.40	15.62	14.45	13.06	11.33	12.16	

Table 3: Hawai‘i GHG Emissions by Sector/Category (MMT CO₂ Eq.). Note data from DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022.

The year 1990 marked peak emissions from AFOLU sources during the time period evaluated; emissions from AFOLU sources decreased by about 24.0 percent between 1990 and 2022. Similarly for the Waste sector, the year 1990 marked peak emissions during the time period evaluated and emissions decreased by about 60.7 percent between 1990 and 2022. Emissions from the IPPU sector have steadily increased since 1990 and were more than four times higher in 2022

compared to 1990 levels. The increase in IPPU emissions is attributable to the growth in hydrofluorocarbons (HFCs) and perfluorocarbons (PFCs) used as substitutes for ozone-depleting substances (ODS); there is no longer cement production in Hawai‘i, and emissions from electrical transmission and distribution has decreased over the time period 1990 to 2022. Lastly, carbon removals from AFOLU sinks have also increased since 1990, growing by roughly 3.6 percent between 1990 and 2022.

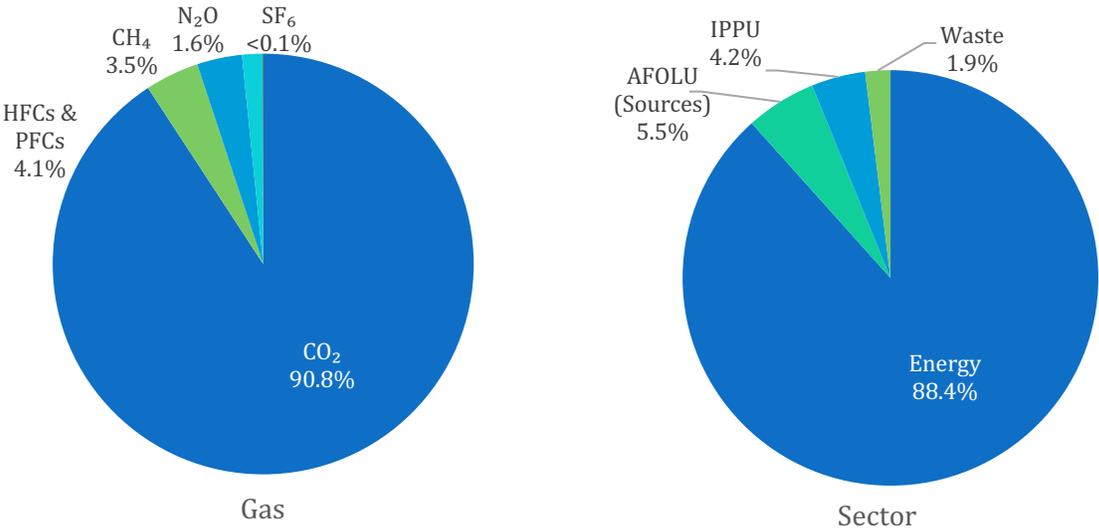


Figure 6: Hawai‘i 2022 GHG Emissions by Sector and Gas. Note data from DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022.

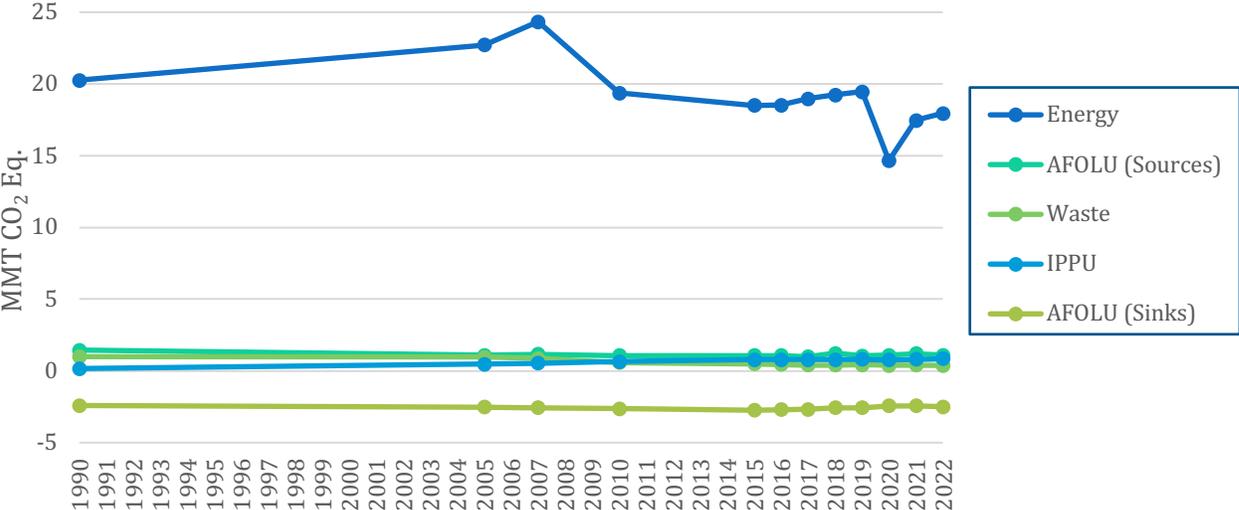


Figure 7: Hawai‘i GHG Emissions by Sector (Including Sinks and Aviation). Note data from DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022.

Additionally, county level emissions were estimated for 2022. In 2022, Honolulu County accounted for the largest share of net GHG emissions (71.3 percent), followed by Maui County (15.3 percent), Hawai‘i County (8.6 percent), and Kaua‘i County (4.8 percent).

5.4 Emission Projections

The projections analysis uses a combination of top-down and bottom-up approaches to develop baseline projections of statewide and county-level GHG emissions for the years 2025, 2030, 2035, 2040, and 2045. The projections for several sources (residential, commercial, and industrial energy use, domestic and international aviation, non-energy uses, composting and wastewater treatment) are based on either a long-range forecast for gross state/county product or future population (including visitor arrivals), using the 2022 statewide GHG inventory as a starting point. Source-specific approaches were taken for several small categories. For example, electricity sales forecasts were used to project GHG emissions for electrical transmission and distribution. Emissions for AFOLU categories and landfill waste are projected by forecasting activity data using historical trends and published information available on expected future trends. Bottom-up approaches are used for GHG emitting sources with substantial federal and state policy intervention (energy industries, substitution of ozone depleting substances, and transportation). Due to policies that affect these sources, projected economic activities are only one component of future GHG emissions. Therefore, a more comprehensive sectoral approach was used to develop baseline projections for these emission sources.

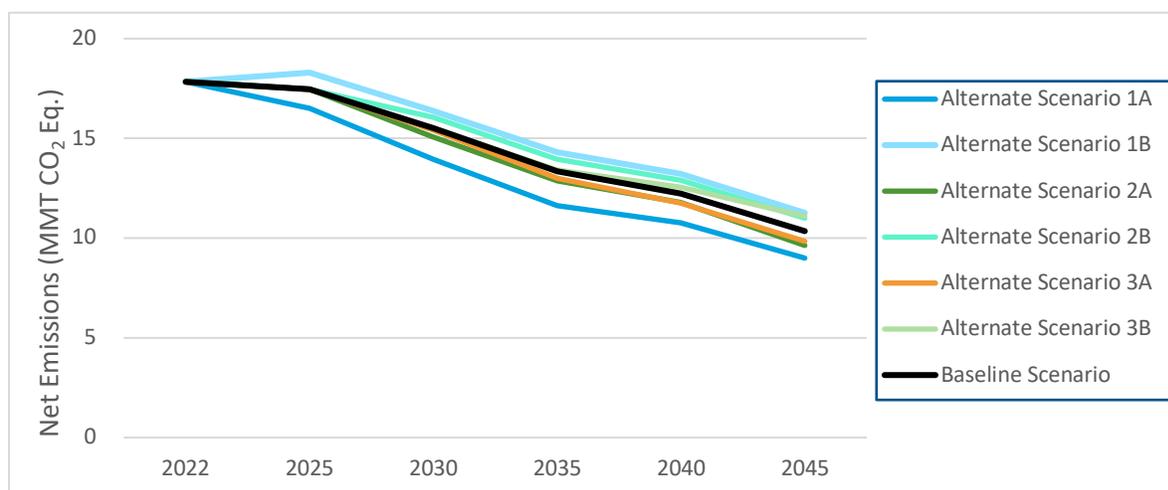


Figure 8: Hawai'i Net GHG Emissions Projections (MMT CO₂ Eq.) (Including Sinks and Aviation). Note data from DOH, Hawai'i Greenhouse Gas Emissions Report for 2022.

The above Figure shows net GHG emissions for the current inventory year and projected inventory years under different scenarios. In addition to the baseline scenario, three major points of uncertainty, namely world oil prices, renewable energy deployment, and ground transportation technology adoption, were assessed by modeling six alternate scenarios for statewide GHG emissions in 2025, 2030, 2035, 2040, and 2045. Alternate Scenario 1A and 1B are based on world oil prices. This alternate scenario looks at both high (Alternate Scenario 1A) and low (Alternate Scenario 1B) future oil price pathways. Alternate Scenario 2A and 2B are based on renewable energy deployment. Alternate Scenario 2A assumes a more aggressive path for renewable energy deployment than the Baseline Scenario. Alternate Scenario 2B projects renewable energy deployment based on the rate of deployment since 2016. Alternate Scenario 3A and 3B are based

on ground transportation technology adoption. This alternate scenario creates a high EV adoption scenario (Alternate Scenario 3A) and a low EV adoption scenario (Alternate Scenario 3B). Hawai‘i GHG emissions for 1990, 2005, 2020, and 2022 and projections of statewide emissions and sinks by sector for 2025, 2030, 2035, 2040, and 2045 are summarized in Table 4.

Sector	1990	2005	2020	2022 ⁵¹	2025 Baseline	2030 Baseline	2035 Baseline	2040 Baseline	2045 Baseline
Energy ⁵²	20.25	22.72	14.66	17.95	17.69	15.92	14.08	13.25	11.52
Industrial Processes and Product Use (IPPU)	0.18	0.50	0.76	0.85	0.80	0.66	0.44	0.28	0.26
AFOLU (Sources)	1.47	1.10	1.10	1.11	1.03	0.98	0.93	0.89	0.85
AFOLU (Sinks)	(2.40)	(2.50)	(2.43)	(2.48)	(2.44)	(2.41)	(2.44)	(2.52)	(2.60)
Waste	1.01	0.98	0.41	0.40	0.36	0.35	0.34	0.33	0.32
Total Emissions (Excluding Sinks)	22.90	25.29	16.93	20.32	19.89	17.91	15.79	14.74	12.95
Net Emissions (Including Sinks)	20.51	22.78	14.50	17.83	17.45	15.51	13.34	12.23	10.35
Aviation ⁵³	5.11	7.16	3.17	5.67	6.10	6.24	6.32	6.38	6.40
Net Emissions (Including Sinks, Excluding Aviation)⁵⁴	15.40	15.62	11.33	12.16	11.35	9.26	7.02	5.85	3.94

Table 4: Hawai‘i GHG Emissions for 1990, 2005, 2020, and 2022 and Projections by Sector under the Baseline Scenario for 2025, 2030, 2035, 2040, and 2045 (MMT CO2 Eq.) Note data from DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022

Relative to 2022, total emissions under the baseline scenario are projected to gradually decrease through 2025, with more significant reductions expected through 2045. Over the same period, net emissions, which take into account carbon sinks and are relevant for tracking progress toward the 2030 GHG target pursuant to Act 238 of 2022, are also expected to follow a similar downward trend, with a slight decrease from 2022 to 2025, followed by more substantial decreases through 2045.

Projections indicated that business-as-usual practices will not meet GHG reduction targets. Net emissions are projected to be 17.45 MMT CO2e in 2025, 15.51 MMT CO2e in 2030, and 10.35

⁵¹ Inventory year 2022 is included as it is used as the starting point of emissions projections.
⁵² Emissions from international bunker fuels are not included in the totals, as per IPCC (2006) guidelines.
⁵³ Domestic aviation and military emissions, which are reported under the Energy sector, are excluded from Hawai‘i’s GHG emission reduction goal established in Act 234 of 2007.
⁵⁴ Totals may not sum due to independent rounding. Parentheses indicate negative values or sequestration.

MMT CO₂e in 2045 far overshooting set goals. Relative to 2019, total emissions under the baseline projection scenario are modeled to decrease by 16% by 2025, 21% by 2030, and 37% by 2045. This trend is largely driven by the projected trend in emissions reduction from energy industries (i.e., electric power plant conversion to comply with RPS mandates), which are expected to decrease substantially between 2019 and 2045.⁵⁵

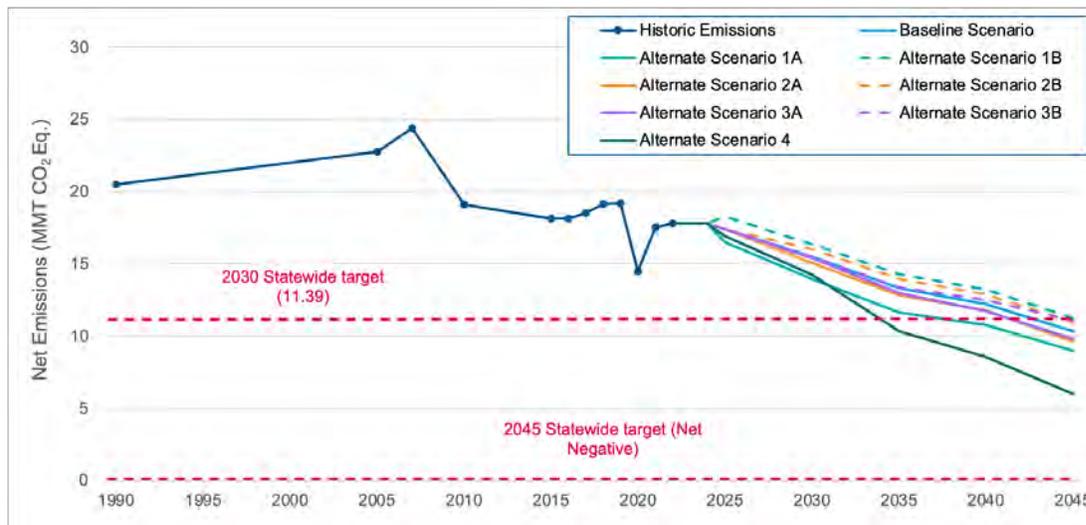
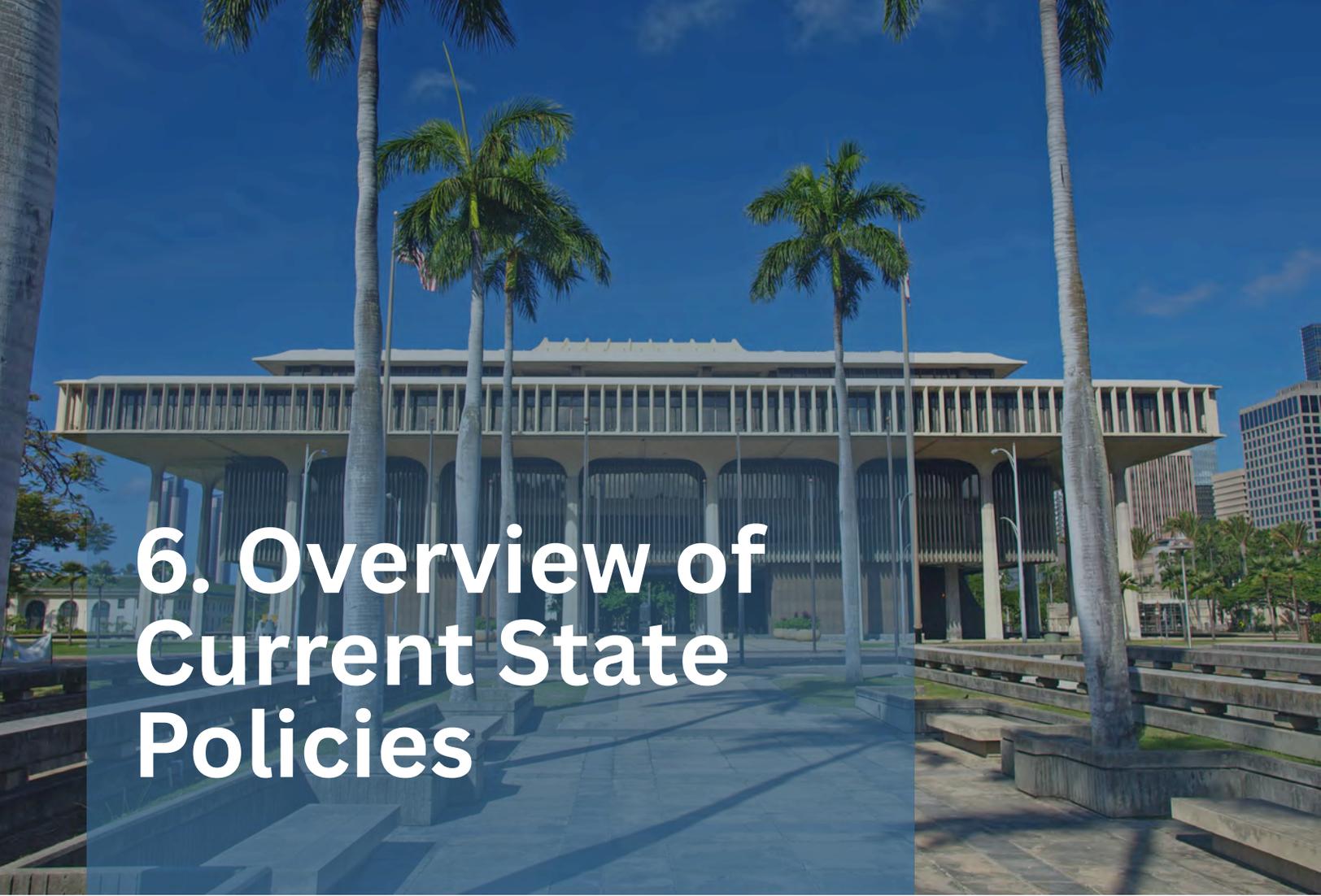


Figure 9: Hawai‘i Net GHG Emissions Estimates and Projections (MMT CO₂ Eq.) (Including Sinks and Aviation). Note, Emission estimates include sinks and domestic aviation emissions, figure taken from DOH, Hawai‘i Greenhouse Gas Emissions Report for 2022.

⁵⁵ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization: Act 238*,



6. Overview of Current State Policies

The State’s role in providing an enabling policy and legislative framework is essential for local jurisdictions and communities to adequately address equity issues of mitigation, adaptation, and resilience. Over the past two and a half decades, several state laws have been established to address climate change mitigation, adaptation, and resilience. As summarized in Act 32, SLH 2017, “Hawai‘i has a tradition of environmental leadership, having prioritized policies regarding conservation, reduction in greenhouse gas emissions, and development and use of alternative renewable energy. The legislature has passed numerous policies and mandates over the last decade to address climate change”.⁵⁶

The measures listed within this CAP complement existing policy or provide GHG reduction where policies and/or targets are lacking enforcement mechanisms or funding.

⁵⁶ Act 32, SLH (2017). A Bill for an Act Relating to Climate Change, https://www.capitol.hawaii.gov/slh/Years/SLH2017/SLH2017_Act32.pdf

Key laws driving GHG mitigation and emission reduction in Hawai‘i include:

- 1) **HRS §225P-5 GHG Emission and Sequestration Target.** Sets a statewide target to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045 and sets an interim target of at least fifty per cent below the level of the statewide greenhouse gas emissions in 2005 by 2030.
- 2) **HRS §342B Part VI. Relates to Air Pollution Control and Greenhouse Gas Emissions.** Requires the State DOH-CAB to complete a greenhouse gas emissions inventory report each year beginning after 2017 to track emissions and determine the State’s progress in the reduction of greenhouse gas emissions; establishes a GHG emission limit.
- 3) **HRS §269-92. Renewable Energy Portfolio Standard.** Requires each electric utility to meet 100% renewable energy generation by 2045. Establishes interim targets of 40% net electricity generation by December 31, 2030; 70% of its net electricity generation by December 31, 2040; and 100% of its net electricity generation by December 31, 2045. Previous target years of 10% by 2010, 15% by 2015, and 30% by 2020 were all met.
- 4) **HRS §196-10.5. Hawai‘i Clean Energy Initiative.** Hawai‘i’s energy transition conversation first launched as the Hawai‘i Clean Energy Initiative (HCEI) in 2008. In 2014, the HCEI renewed Hawai‘i’s commitment to setting bold clean energy goals, including achieving the nation’s first-ever 100 percent renewable portfolio standards (RPS) by 2045.
- 5) **HRS §225P-3. Establishes a statewide Climate Change Mitigation and Adaptation Commission (CCMAC).** Affirms commitment to the US’s pledges under the Paris Agreement to combat climate change by systematically reducing greenhouse gas emissions and improving resilience to climate change. Requires participation of the heads of several key state agencies and legislative committees.
- 6) **HRS §269-96. Energy Efficiency Portfolio Standard (EEPS).** 4,300 gigawatt hours of electricity use reductions statewide by 2030. The HPUC may establish incentives and penalties based on performance in achieving the energy-efficiency portfolio standards (EEPS) by rule or order. There is a current administrative, governor-supported bill to extend the EEPS to 2045.
- 7) **HRS §269-121. Public benefits fee authorization.** Allows a portion of the moneys collected by Hawai‘i’s electric utilities from its ratepayers through a demand-side management surcharge to establish public benefits fee. The public benefits fee shall be used to support clean energy technology, demand response technology, and energy use reduction, and demand-side management infrastructure, programs, and services
- 8) **HRS §196-63 and 196-64. Hawai‘i Green Infrastructure Authority (HGIA).** The HGIA manages the Hawai‘i Green Energy Market Securitization (GEMS) Program and brings clean energy technologies to Hawai‘i ratepayers, including those who are underserved, by providing innovative financing products that result in electricity bill savings for customers with no money down. The GEMS Program is intended to create a sustainable financing structure through market-driven public-private partnerships that will open access to financing for more Hawai‘i customers and democratize access to clean energy.
- 9) **HRS §196. Act 239 (2022)** added two new sections addressing energy efficiency implementation for state facilities. Requires state facilities over 10,000 square feet to implement cost-effective energy efficiency measures, requires, where feasible and cost-effective, the design of all new state building construction to maximize energy and water

efficiency and energy generation potential and to use building materials that reduce the carbon footprint of the project.

- 10) **HRS §103D-412. Motor vehicle requirements for state fleets.** All agencies purchasing or leasing light-, medium-, and heavy-duty motor vehicles shall seek vehicles that reduce dependence on petroleum-based fuels that meet the needs of the agency. Priority shall be 1) ZEVs, 2) plug-in hybrid electric vehicles, 3) alternative fuel vehicles; and 4) hybrid electric vehicles.
- 11) **Act 096 (2025) Relating to economic development.** Increases the Transient Accommodations Tax rate beginning on 1/1/2026 by .75% to support a climate impact fee to be used for environmental stewardship, climate and hazard resiliency and sustainable tourism.
- 12) **Act 103 (2025) Extended producer responsibility program for packaging materials and paper products.** Establishes an advisory council to review the draft needs assessment and propose recommendations throughout the assessment process. Requires the Department of Health to hold a public hearing on the draft needs assessment and complete and submit the needs assessment to the Legislature by 12/31/2027. Appropriates funds.
- 13) **Act 162 (SB1298) Relating to recycling.** Expands the types of electronic devices subject to the Electronic Device Recycling and Recovery Act to include electronic device peripherals and certain legacy devices. Excludes manufacturers of only electronic device peripherals and no other electronic devices. Allows, rather than requires, the Department of Health to determine additional penalties. Requires manufacturers' recycling plans to describe communication efforts with the State and counties to facilitate consumer education efforts. Repeals the requirement that recycling plans be implemented and fully operational by 1/1/2023 in order for manufacturer collaboration authority to apply. Establishes additional manufacturer recycling goals beginning on 1/1/2026 and 1/1/2027. Requires additional information to be included in manufacturers' reports containing information for calendar years 2025, 2026, and 2027. Requires collectors to report certain information regarding recyclers and refurbishers and allows the Department of Health to require submission of bills of lading and recycler receiving reports.
- 14) **Act 192 (SB1220) Relating to renewable gas tariff.** Requires gas utility companies to submit proposed renewable gas tariffs to the Public Utilities Commission by 8/31/2025. Requires the Public Utilities Commission to establish a renewable gas tariff within nine months of receiving a completed application for a proposed renewable gas tariff.
- 15) **Act 209 (HB242) Relating to electric vehicle batteries.** Establishes a working group within the Hawai'i State Energy Office to examine how to maximize the recycling and reuse of electric vehicle batteries and recommend electric vehicle battery management practices. Requires a report to the Legislature.
- 16) **Hawai'i Administrative Rules (HAR), Chapter 11-60.1** was amended in 2014 to establish a facility-level GHG emissions cap for large existing stationary sources with potential GHG emissions at or above 100,000 tons of CO₂ Eq. per year.



7. Energy Industries

MEASURES

- 1. INCREASE RENEWABLE ENERGY GENERATION**
- 2. PERMITTING IMPROVEMENTS TO MEET RENEWABLE PORTFOLIO STANDARD (RPS) TIMELINES**
- 3. EFFICIENCY IMPROVEMENTS TO POWER PLANTS THAT USE FOSSIL FUELS**
- 4. RESILIENCE IMPROVEMENTS TO POWER GRID**

7. Energy Industries

7.1 Overview

Hawai‘i stands at a pivotal juncture in its energy evolution, grappling with unique challenges while simultaneously pioneering a transformative shift towards a sustainable, renewable future. The Hawaiian Islands, by virtue of their geographic isolation, have historically faced distinct energy challenges. A heavy dependence on imported petroleum for electricity generation has had profound economic consequences, contributing to Hawai‘i consistently experiencing the highest electricity costs in the United States, more than triple the U.S. average price, a significant burden on both residents and businesses.⁵⁷ Furthermore, the state's limited land area, high land costs, and diverse and sensitive ecosystems present inherent complexities for the development of large-scale utility energy infrastructure, demanding careful planning and community engagement for the deployment of renewable energy facilities.

The combination of persistently high fossil fuel costs and the inherent vulnerability created by its geographic isolation has created a strong impetus for Hawai‘i to transition to renewable energy sources. This goes beyond environmental considerations. For Hawai‘i, investing in renewable energy directly addresses a core economic vulnerability—the high and volatile cost of electricity—by replacing an expensive, imported oil with locally generated power from resources like sun, wind, and geothermal. This economic driver provides a robust and enduring foundation for the state's policy commitments, distinguishing Hawai‘i's energy transition from that of many continental states where renewable energy adoption might be perceived primarily as an environmental choice. This fundamental economic imperative strengthens the state's resolve and provides a powerful, sustained political and public motivation for achieving its ambitious energy goals, positioning the 100% Renewable Portfolio Standard (RPS) not merely as an environmental aspiration but as an economic necessity for the state's long-term prosperity and energy security.

This commitment to decarbonizing the electricity sector is a cornerstone of Hawai‘i's broader climate goals, which aim for substantial greenhouse gas (GHG) emission reductions across all economic sectors. These targets include a 50% reduction in statewide GHG emissions below 2005 levels by 2030, established by Act 238 (2022) and the ambitious long-term goal of achieving net-negative emissions by 2045, established by Act 15 (2018). The comprehensive transformation of the energy sector, particularly electricity generation, is foundational to realizing these overarching climate objectives.

Utility companies across Hawai‘i are rapidly advancing renewable energy infrastructure to meet clean energy goals. Hawaiian Electric lists four new solar-plus-storage projects in service on O‘ahu, Maui, and Hawai‘i Island and has eleven additional projects planned between 2026 and 2030, together they would produce 862 megawatts of new clean capacity.⁵⁸ Kaula‘i Island Utility Cooperative is proposing two major solar-plus-battery-storage projects rated at 35 MW and 43

⁵⁷ U.S. Energy Information Administration. (n.d.). *Hawai‘i Profile*.

⁵⁸ Hawaiian Electric- Our Clean Energy Portfolio, <https://www.hawaiianelectric.com/clean-energy-hawaii/our-clean-energy-portfolio/renewable-project-status-board>

MW, which are expected to power more than 30,000 homes and provide up to 40 percent of the island's electricity, helping Kaua'i approach 80 percent renewable power generation by 2028.⁵⁹ These projects are a good start but accelerated timelines and additional projects are needed to meet targets and transition away from volatile fossil fuels pricing.

Hawai'i's 100% RPS by 2045 represents more than just an aggressive target; it embodies a pioneering legislative and operational framework for island states and isolated grids worldwide. The state's pursuit of this goal, given its unique grid characteristics and geographical constraints, is an unprecedented undertaking for an entire state-level energy system. The strategies, technologies, policy innovations, and lessons learned from challenges experienced by Hawai'i in this endeavor continue to offer invaluable, real-world case studies for other island nations, remote communities, and even larger grids striving for high renewable energy penetration. This positions Hawai'i as a global leader and a critical source of practical knowledge and experience in the complex energy transition underway across the globe.

7.2 Key Features

Hawai'i's energy policy has undergone a profound transformation, shifting from a traditional model heavily reliant on fossil fuels to a progressive clean energy framework. This evolution is marked by several key legislative milestones, including Act 234 (2007), Act 97 (2015), Act 15 (2018), Act 74 (2021), and Act 238 (2022). Most notably, Act 15 (2015) legally enshrined the 100% Renewable Portfolio Standard (RPS) by 2045, making Hawai'i the first U.S. state to adopt such a comprehensive mandate. These legislative actions provide a clear, long-term directive for the state's energy future.⁶⁰

The historical reliance on imported fossil fuels has resulted in the nation's highest electricity prices, more than triple the U.S. average. While this provides a strong economic incentive for renewable energy, it also means that the significant costs associated with grid upgrades and new infrastructure must be meticulously managed to prevent further consumer burden. The high cost of living in the state has made affordability a central theme of all energy conversations. Balancing short term high-cost investments for long term energy security with the volatility of oil prices influences the State's ongoing energy transition to renewable and low-carbon technologies. Investment costs and increased energy demand can be offset by energy efficiency measures and matching transition with grid improvements. According to the PUC;

“once fossil fuel generation of electricity decreases to no more than 40 percent on each island, electric rates will be far less exposed to “rate shock” from oil price surges that periodically afflict Hawaiian Electric customers, most recently relating to the Ukraine war. Over the last decade, the Commission estimates that oil price

⁵⁹ Kaua'i Island Utility Cooperative, KIUC Proposes New Renewable Projects, accessed December 5, 2025, <https://kiuc.coop/news/kiuc-proposes-new-renewable-projects#:~:text=Kaua%CA%BBi%20Island%20Utility%20Cooperative%20is%20pursuing%20two%20new,KIUC%E2%80%99s%20president%20and%20chief%20executive%20officer%2C%20David%20Bissell.>

⁶⁰ Hawai'i State Energy Office. (2023, December). *Hawai'i Pathways to Decarbonization: Act 238*,

volatility diverted hundreds of millions of dollars from the pocketbooks of Hawaiian Electric customers.”⁶¹

Ultimately the transition away from fossil fuels can lead to more affordable energy systems with proper management to limit impact.

Balancing the state's ambitious goals with considerations of affordability, grid reliability, and public interest has created a unique dynamic: while the 100% RPS mandate provides an unequivocal goal, the Hawai‘i Public Utilities Commission’s (PUC’s) role in approving specific projects and associated costs means that the speed of the transition is also heavily influenced by regulatory prudence and its interpretation of public interest considerations such as reliability and affordability. This dynamic can lead to both potential bottlenecks and, conversely, innovative regulatory approaches designed to accelerate the transition while safeguarding consumer interests and grid stability. The PUC's efficiency to approve innovative, potentially higher-cost projects with long term benefits such as energy security, reliability and affordability, such as advanced energy storage and significant grid upgrades, will be as critical to meeting the 2045 goal as the technological advancements themselves, highlighting the importance of regulatory foresight and flexibility. The PUC also opened the Energy Equity and Justice Docket (EEJD) in 2022, a proceeding aimed at ensuring fairness and justice in the energy transition, particularly for environmental justice, frontline, and low-income communities.^{62, 63}

Current Renewable Electricity Penetration and Key Technologies:

As of 2024, Hawai‘i’s consolidated Renewable Portfolio Standard (RPS) for electricity generation reached 36%. The state's renewable energy mix is dominated by several key technologies:

- **Solar PV:** Both utility-scale and distributed roof top solar photovoltaic (PV) systems are leading contributors to Hawai‘i's renewable energy supply, with approximately two-thirds of solar power coming from distributed, customer-sited systems on rooftops and over parking lots statewide.⁶⁴
- **Wind Power:** Utility-scale wind farms also make substantial contributions, particularly on islands like O‘ahu and Maui.
- **Geothermal:** Hawai‘i Island is unique in its utilization of geothermal energy. The Puna Geothermal Venture (PGV) provides a crucial source of baseload renewable power, offering a non-intermittent complement to variable solar and wind resources.
- **Biomass and Hydro:** Smaller, but still important, contributions come from biomass and hydroelectric facilities.
- **Energy Storage:** The deployment of utility-scale battery energy storage systems (BESS) has been critical for firming variable renewable generation, providing essential ancillary services, and maintaining overall grid stability. This makes Hawai‘i a leading case study

⁶¹ Hawai‘i Public Utilities Commission. (n.d.). *Energy Equity and Justice (Docket 2022-0250)*. 2025, from <https://puc.hawaii.gov/dockets/docket-2022-0250-energy-equity-and-justice/>

⁶² Hawai‘i Public Utilities Commission. (n.d.). *Energy Equity and Justice (Docket 2022-0250)*.

⁶³ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization: Act 238, Session Laws of*

⁶⁴ U.S. Energy Information Administration. (n.d.). *Hawai‘i Profile*. Retrieved June 16, 2025, from <https://www.eia.gov/state/print.php?sid=HI>

for how to integrate very high levels of variable renewables into constrained grids, setting a precedent for the critical role of energy storage in future decarbonized grids globally.

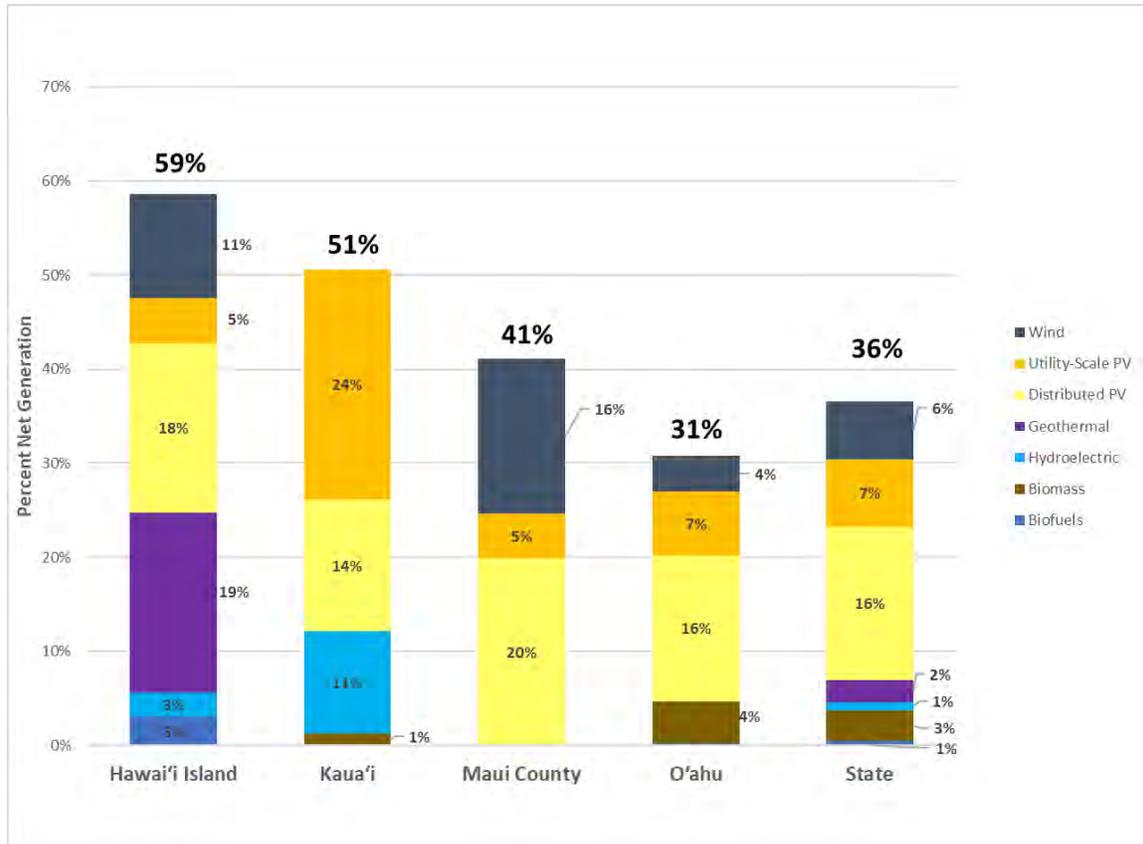


Figure 10: Renewable Portfolio Standards by Generation Source for 2024, Source PUC Docket 2007-0008, compiled by Hawai'i State Energy Office

7.3 Numbers and Targets: Current Status and Future Goals

Despite the significant strides made in renewable energy deployment, fossil fuels continue to constitute a majority of Hawai'i's electricity generation. In 2022, total GHG emissions in Hawai'i were 20.32 MMT CO₂ Eq., with net emissions (including carbon sinks) at 17.83 MMT CO₂ Eq. The Energy sector accounted for the largest portion of total emissions in Hawai'i in 2022, with both Stationary Combustion and Transportation totaling 17.95 MMT CO₂ Eq. Within the Energy sector, stationary combustion accounted for the largest share at 6.37 MMT CO₂ Eq.^{65, 66}

⁶⁶ Hawai'i Department of Health. (2025, April). *Hawai'i Greenhouse Gas Emissions Report for 2022* (pp. 27, 35). <https://health.hawaii.gov/cab/files/2025/04/Final-2022-GHG-Emissions-Report.pdf>

The total electricity generated across Hawai‘i in 2024 was approximately 10,862 GWh.⁶⁷ In 2024, about 64% of the electricity generated by the electric power industry was from petroleum fuel, down 26% points from 1990.⁶⁸ This highlights the considerable scale of the remaining transition required to achieve the state's 100% renewable energy goal.

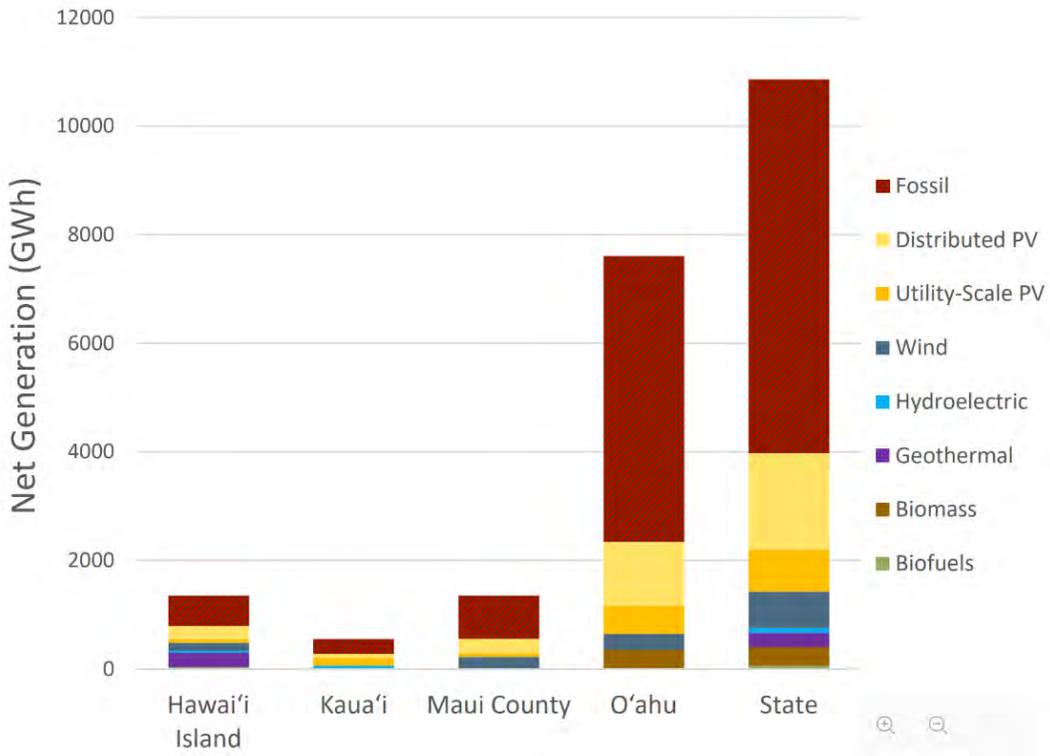


Figure 11: Net Energy Generation Source for 2024, Source PUC Docket 2007-0008, compiled by Hawai‘i State Energy Office

Reduction Targets (2030 and 2045):

Hawai‘i has established a clear and aggressive roadmap for its energy and climate future, marked by specific, legally mandated reduction targets.

Renewable Portfolio Standard (RPS) Targets:

- **2030 Target:** 40% of electricity sales from renewable energy sources.
- **2040 Target:** 70% of electricity sales from renewable energy sources.
- **2045 Target:** 100% of electricity sales from renewable energy sources.
- KIUC has set an ambitious goal to reach 100% renewable energy by 2033, exceeding the state's 2045 timeline by a more than a decade.

⁶⁷ Public Utilities Commission (2024). Docket 2007-2008 Renewable Portfolio Standards Annual Reports. <https://puc.hawaii.gov/reports/energy-reports/renewable-portfolio-standards-rps-annual-reports/>

⁶⁸ Public Utilities Commission (2024). Docket 2007-2008 Renewable Portfolio Standards Annual Reports.

- January 2025 Governor Green issued executive order 25-01 which called for accelerated targets for Maui, Moloka‘i, Lana‘i, Kaua‘i and Hawai‘i island. The executive order called for a 100% RPS for these islands by 2030. This call to action has directed HSEO, the PUC, HECO and KIUC to work together to come up with creative solutions to achieve this.

State-Level GHG Emission Reduction Targets (Overall and Energy Sector Contribution):

- **2030 Target:** Reduce statewide GHG emissions by 50% below 2005 levels, established by Act 238 (2022). The electricity generation sector is expected to contribute substantially to this reduction through the rapid deployment of renewables and the systematic phasing out of fossil fuel power plants. The 2005 baseline (including aviation) was 22.78 MMT CO₂ Eq., setting the 2030 target level at 11.39 MMT CO₂ Eq.¹³.
- **2045 Target:** Achieve net-negative GHG emissions statewide, established by Act 15 (2018). This highly ambitious long-term goal necessitates a complete decarbonization of the electricity sector and may eventually require the implementation of carbon removal technologies to offset residual emissions from harder-to-abate sectors.⁶⁹

Progress Towards Targets:

While Hawai‘i met its 2020 GHG emissions target (excluding aviation), The State is not on track to meet its 2030 targets. Projections indicate 2045 statewide emissions targets will be difficult to achieve due to challenging permitting processes, land use constraints, and a lack of cost competitive alternatives for aviation fuels. Some wind resources will also retire and may need to be decommissioned and the system capacity replaced by other projects.⁷⁰ The State’s consolidated RPS reached 36% in 2024, demonstrating consistent progress towards these ambitious goals.⁷¹ The forecasted electricity demand for 2030 is approximately 10,000 GWh, necessitating a significant increase in renewable generation to meet the 40% RPS target.

7.4 Challenges and Innovations

The path to 100% renewable energy is fraught with technical, economic, and social complexities.

- **High Capital Costs:** Extraordinary investments are required to accomplish essential, transformative improvements. Clean-energy projects especially utility-scale renewables like solar farms, wind farms, storage, and grid upgrades require large up-front investment. Financing those relies heavily on borrowing and/or equity. Capital constraints caused by the impact of Maui wildfire related liabilities on Hawaiian Electric’s credit rating, Hawai‘i’s exceptionally high electric rates and other economic headwinds has compounded

⁶⁹ Hawai‘i Department of Health. (2025, April). *Hawai‘i Greenhouse Gas Emissions Report for 2022* (p. ES-1, ES-3, ES-10, 9, 12).

⁷⁰ HDOH. (2025, April). *Hawai‘i Greenhouse Gas Report for 2022* (p. ES-1, ES-3, ES-10, 9, 12).

⁷¹ Data compiled by the Hawai‘i State Energy Office (HSEO), Source Public Utilities Commission (PUC) Docket 2007-0008. 2024 Renewable Portfolio Standards (RPS) Annual Status Reports.

challenges in financing renewable energy projects.⁷² It is vital that Hawai‘i face the challenges head on. In 2024 the PUC made this clear "it cannot be overstated that investing now will save lives and money in the short and long run".⁷³

- **Grid Modernization and Integration of High Levels of Variable Renewable Energy:** Integrating large quantities of intermittent solar and wind power into small, isolated island grids presents formidable technical challenges. These include maintaining grid stability (frequency and voltage), managing rapid fluctuations in generation (known as "ramps"), and ensuring continuous reliability during periods of low renewable output or high demand. The existing transmission and distribution infrastructure, originally designed for centralized fossil fuel generation, is not inherently suited for a high penetration of distributed and variable renewable sources. This necessitates substantial upgrades and the widespread implementation of smart grid technologies to enhance grid visibility, control, and responsiveness. The increasing unavailability of Hawaiian Electric's firm generators due to unplanned outages, with approximately 20% of the fleet recently offline or operating at derated capacity at a given time, further highlights the urgent need for grid modernization and replacement capacity.⁷⁴
- **Energy Storage Requirements and Deployment Challenges:** Energy storage, primarily in the form of large-scale battery systems, is indispensable for integrating variable renewable energy, providing essential ancillary services (like frequency regulation), and shifting renewable energy generation to align with periods of peak demand. However, the deployment of these critical systems faces hurdles, including the high capital costs associated with battery technology, global supply chain constraints that can impact availability and pricing, and the complex siting and permitting processes required for large-scale facilities.
- **Land Use and Community Acceptance Issues:** Siting any new utility-scale energy projects, including solar farms and wind farms, is a major challenge in Hawai‘i due to the state's limited land area, the proximity to nearby communities and culturally significant sites, and the competing demands for agricultural, industrial, housing especially as folks will need to be moved off coasts as sea levels rise, and conservation lands; this is particularly challenging on O‘ahu, where energy demand is highest. Strong community opposition can arise due to concerns about inequitable siting, visual impacts, noise pollution, or threats to cultural sites. The persistent and critical challenge of securing community acceptance and navigating complex land use regulations suggests that future project development will increasingly require innovative community engagement models, equitable project distribution and benefit-sharing schemes, and potentially a strategic shift towards less land-intensive or offshore solutions to mitigate land-use conflicts. Further,

⁷² Hawai‘i Public Utilities Commission. (2024) Inclinations on the Future of Energy in Hawaii. Pg2 https://puc.hawaii.gov/wp-content/uploads/2025/01/Hawaii-PUC-Energy-Inclinations-White-Paper-FINAL.12.31.24_signed.pdf

⁷³Hawai‘i Public Utilities Commission. (2024) Inclinations on the Future of Energy in Hawaii. Pg2

⁷⁴ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Repowering, and Energy Transition Study* (p. 6, Figure 4). <https://energy.hawaii.gov/wp-content/uploads/2025/01/HSEO-Alternative-Fuels-Study-Final-Report.pdf>

these challenges also point to the need to raising awareness about the importance of renewable energy projects for Hawai‘i, for its energy security, for combating climate change as well as for decreasing energy costs.

- **Permitting:** The regulatory and permitting process, involving a mix of state and county jurisdiction, has been identified as a significant barrier to completing projects in a timely manner, potentially impacting fossil fuel retirement timelines.⁷⁵ However, the City and County of Honolulu has undertaken a major rebuilding of their permitting system which may result in significant improvement in the near future.

Despite the challenges, Hawai‘i is at the forefront of developing and deploying innovative solutions to accelerate its clean energy transition.

- **Renewable Resource Potential:** Hawai‘i is endowed with exceptional solar insolation and strong, consistent wind patterns; however, development of these resources is constrained by limited land availability, competing land use priorities, and increased setback distances and siting requirements necessary to address community proximity. Hawai‘i may also possess significant geothermal resource probability, but further resource characterization and research drilling is necessary to determine potential. Furthermore, studies indicate substantial offshore wind potential, particularly off O‘ahu, offering a long-term, high-capacity solution that could alleviate onshore land-use pressures, although significant uncertainties remain regarding floating technology, costs, and the complexities of interconnection of a large resource such as offshore wind.⁷⁶
- **Innovation Catalyst:** The formidable challenges inherent in managing isolated island grids compel Hawai‘i to innovate in critical areas such as grid modernization, advanced energy storage, and microgrid development. This necessity effectively positions the state as a living laboratory and a global leader in developing and deploying advanced energy solutions. This generates invaluable expertise and practical solutions that can be exported or replicated in other isolated or vulnerable energy systems worldwide, making Hawai‘i a key contributor to the global energy transition.
- **Advanced Grid Technologies:** Hawai‘i is making significant investments in smart grid technologies to enhance grid visibility, control, and resilience. This includes the deployment of advanced metering infrastructure, sophisticated distribution automation systems, smart inverters, and intelligent grid management platforms. Concurrently, microgrids are being developed for critical facilities and communities, offering localized energy resilience and the ability to operate independently during broader grid outages, thereby enhancing overall reliability.⁷⁷
- **Land Use ACT 187** tasked OPSD to undertake Hawai‘i’s first-of-its-kind Integrated Land Use Study to determine how much land is needed statewide to meet statutory sustainability, climate adaptation, energy, agriculture, and housing mandates through 2050 (e.g., Acts

⁷⁵ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization*: (p. 10).

⁷⁶ National Renewable Energy Laboratory. (n.d.). *Economic Impacts of Floating Offshore Wind in Hawai‘i* (p. ES-1). Retrieved from <https://docs.nrel.gov/docs/fy16osti/65481.pdf>

⁷⁷ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization*: (p. 4, 9, A-2).

151, 175, and 176 for local food, 100% renewable energy by 2045, and long-term affordable housing goals).

- **Utility-Scale Battery Storage Projects:** These projects are crucial for integrating variable renewables, providing grid stability, and enabling the retirement of fossil fuel power plants. Notable examples include:
 - **Kapolei Energy Storage (KES):** A substantial 185 MW/565 MWh battery system on O‘ahu, which is among the largest in the world and designed to provide critical firming capacity and essential grid services.⁷⁸
 - **AES West O‘ahu:** A 12.5 MW/50 MWh solar-plus-storage project in Kapolei, O‘ahu.
 - **Lāwa‘i Solar and Energy Storage Project:** Kaua‘i Island Utility Cooperative (KIUC) made history in 2018 by inaugurating the Lāwa‘i Solar and Energy Storage Project, creating a new model for delivering large-scale renewable energy. The first of-its-kind DC-coupled solution and was the world’s largest operational solar-plus-storage system when the plant became operational.

The rapid deployment of utility-scale battery storage solutions is not merely an innovation; it represents a strategic necessity that defines Hawai‘i’s approach to grid decarbonization. This signifies a fundamental shift from a mindset of simply "building more renewables" to one focused on "building a resilient, dispatchable renewable grid." This approach acknowledges that energy storage is the lynchpin for achieving 100% RPS on isolated grids without compromising reliability. This heavy investment in storage, alongside renewable generation, indicates a clear understanding that achieving 100% renewables on isolated grids requires robust firming capacity and grid stability that advanced storage provides. This strategic prioritization of storage demonstrates Hawai‘i’s pragmatic approach to its ambitious goals, recognizing that simply adding more solar and wind could destabilize the grid. Instead, dispatchable, reliable power enabled by storage is essential. This makes Hawai‘i a leading case study for how to integrate very high levels of variable renewables into constrained grids, setting a precedent for the critical role of energy storage in future decarbonized grids globally.

- **Geothermal Expansion:** Early challenges and lessons learned from Hawai‘i’s first geothermal plant can and should inform today’s dialogue around new geothermal development. Geothermal energy can play a crucial role in an environmentally responsible phased transition toward cleaner fuel and electricity generation. Geothermal offers greater long-term reliability than other renewable sources. Most importantly, it is a public trust resource and must be approached with care and reverence if Hawai‘i is to expand its use. Hawai‘i Island continues to utilize the Puna Geothermal Venture (PGV) for baseload renewable power, offering a stable, non-intermittent renewable source that complements variable renewables.⁷⁹ The potential for increasing the use of geothermal energy in Hawai‘i

⁷⁸ AES Hawai‘i. (n.d.). *Hawai‘i Projects*. <https://www.aes-hawaii.com/hawaii>

⁷⁹ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Repowering, and Energy Transition Study* (p. 29). <https://energy.hawaii.gov/wp-content/uploads/2025/01/HSEO-Alternative-Fuels-Study-Final-Report.pdf>

Island, as well as in Maui and Oahu is being actively researched, with drilling of test sites funded by current legislation. Geothermal energy could provide an even larger part of Hawai‘i’s renewable energy portfolio. With that said, care needs to be taken with the equitable distribution of the benefits of geothermal energy and consultation with impacted communities must be central in future developments of this energy source.

- **Alternative Fuels as Bridging Solutions:** Recognizing the need for firm, dispatchable generation during the transition, Hawai‘i is evaluating alternative fuels. Liquefied Natural Gas (LNG) is being considered as a near-term bridging solution to replace high-carbon Low Sulphur Fuel Oil (LSFO), with the flexibility to transition to lower-carbon, fossil-free alternatives like hydrogen and ammonia in the long term (post-2045).⁸⁰ This approach aims to reduce lifecycle carbon intensity, with LNG offering a 38% to 44% reduction compared to LSFO when used in more efficient power plants, while hydrogen offers a significantly lower carbon intensity (40 gCO₂e/kWh) compared to LNG (630 gCO₂e/kWh) or biodiesel (200-410 gCO₂e/kWh).⁸¹ While infrastructure investments are significant and does not address energy security leaving Hawai‘i vulnerable to volatile energy costs this strategy minimizes stranded asset risks by incorporating dual-fuel infrastructure that can adapt to technological and economic advancements.⁸²
- **Tidal and Wave Energy:** Ocean energy systems can harness energy from the power of ocean waves, tides, and currents, or even the differences in salt levels, temperatures, and pressure. These resources are incredibly predictable, meaning ocean energy technologies have the potential to be important contributors to a reliable and clean electricity grid. Currently the technology is not developed to commercial capacity and not economically viable for the state though continued research and development are underway.
- **Demand-Side Management and Grid Services from Distributed Energy Resources (DERs):** Programs are being developed to harness the collective potential of distributed energy resources, including rooftop solar, electric vehicles, and smart appliances. These resources can provide valuable grid services, enable load shifting, and enhance overall grid flexibility. This includes the development of virtual power plants (VPPs) that aggregate and manage numerous DERs to act as a single, dispatchable resource.
- **Permitting Streamlining and Regulatory Improvements:** To accelerate project timelines, policy recommendations include prioritizing brownfield development and infrastructure reuse, implementing permit assistance programs, and assigning dedicated staff at state and county agencies to focus exclusively on energy development permits. This aims to streamline processes without bypassing necessary regulatory reviews or safeguards, while ensuring thorough environmental impact evaluation and public participation through processes like the National Environmental Policy Act (NEPA) and Hawai‘i Environmental Policy Act (HEPA).⁸³
- **Research and Development Initiatives:** Ongoing research and development efforts are focused on optimizing renewable energy integration, improving the efficiency and cost-effectiveness of energy storage technologies, and exploring novel clean energy solutions specifically tailored to the unique conditions of island environments.

⁸⁰ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Study* (p.14)

⁸¹ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Study* (p.9)

⁸² Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Study* (p.53)

⁸³ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Study* (p.74)

7.5 County-Level Variations and Actions

While the State of Hawai‘i sets overarching Renewable Portfolio Standard (RPS) and greenhouse gas (GHG) reduction targets, the implementation and progress of the energy transition vary significantly across Hawai‘i's four main counties City & County of Honolulu (O‘ahu), Maui County (Maui, Moloka‘i, Lāna‘i), Hawai‘i County (Hawai‘i Island), and Kaua‘i County (Kaua‘i). Each county - possesses distinct energy profiles, resource availability, land-use dynamics, and local initiatives.

Counties climate action plans and sustainability goals complement, and, in some cases, exceed state mandates. These localized efforts are crucial for implementing projects on the ground, addressing community-specific needs, and navigating unique local concerns. The Hawai‘i State Energy Office's RPS progress report provides island-specific data, illustrating the varied pace and composition of renewable energy adoption across the archipelago. This decentralized approach allows for tailored solutions that best fit each island's unique context. In 2022, Honolulu City and County accounted for the largest share of net GHG emissions (71.3%), followed by Maui County (15.3%), Hawai‘i County (8.6%), and Kaua‘i County (4.8%).⁸⁴ The majority of emissions in all four counties were generated within the energy sector. The distinct characteristics and progress of each county highlight the diverse pathways to achieving Hawai‘i's statewide renewable energy goals.

- **O‘ahu (City & County of Honolulu):**
 - As the most populous island, O‘ahu is the focus of major utility-scale solar and battery storage projects, such as Kapolei Energy Storage (KES) and AES West O‘ahu, specifically designed to replace large fossil fuel power plants.
 - O‘ahu's energy transition strategy heavily relies on these large-scale utility projects and significant grid modernization efforts to meet its substantial demand and overcome limited land availability for widespread distributed generation.
 - In 2024, O‘ahu's RPS progress (for Hawaiian Electric) stood at 31%.⁸⁵
 - The City & County of Honolulu has its own Climate Action Plan, which includes goals for reducing emissions and promoting clean energy.⁸⁶
- **Maui County (Maui, Moloka‘i, Lāna‘i):**
 - Maui has experienced significant utility-scale solar and wind development. A key challenge for Maui County involves effectively managing grid stability with high renewable penetration across its smaller, interconnected island grids.
 - Maui County has also been proactive in developing local climate action plans and actively promoting community-based renewable energy projects, fostering greater local participation.
 - Maui County's RPS progress (for Hawaiian Electric) was 41% in 2025.
- **Hawai‘i Island (Hawai‘i County):**

⁸⁴ Hawai‘i Department of Health. (2025, April). *Hawai‘i Greenhouse Gas Emissions Report for 2022* (p. ES-7).

⁸⁵ Hawaiian Electric. (2025, January). *Hawaiian Electric Surges to 36% Renewable Energy on Grids*. Retrieved from <https://www.hawaiianelectric.com/hawaiian-electric-achieves-32-renewable-energy-in-2022>

⁸⁶ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (n.d.). *O‘ahu Climate Action Plan*. <https://resilientoahu.org/s/Climate-Action-Plan.pdf>

- Hawai‘i Island is unique for its utilization of baseload geothermal power from the Puna Geothermal Venture (PGV). This facility provides a stable, non-intermittent renewable energy source, diversifying the island's energy mix beyond variable solar and wind.⁸⁷
- The island faces specific challenges related to managing volcanic activity, which can impact energy infrastructure, and ensuring community acceptance for any potential expansion of geothermal operations.
- Hawai‘i Island demonstrated an RPS progress (for Hawaiian Electric) of 59% in 2025.
- **Kaua‘i (Kaua‘i County):**
 - The Kaua‘i Island Utility Cooperative (KIUC) stands out as a national and international leader in renewable energy integration. KIUC achieved an impressive 60.2% renewable energy for its generation mix in 2022, but dropped down to 51% in 2025.⁸⁸ KIUC’s renewable portfolio is comprised of solar and battery storage, hydropower, biomass, and biodiesel.
 - KIUC's member-owned cooperative model facilitates direct community engagement and enables innovative project financing, serving as a potential blueprint for other isolated island grids globally.
 - KIUC's Board of Directors updated its Strategic Plan to reach 100% renewable energy by 2033, accelerating the state's 2045 timeline by more than a decade.⁸⁹

7.6 Measure Description and GHG Reduction

Energy Generation by Source

Hawai‘i State Energy Office (HSEO) has modeled various energy generation scenarios that can meet the current and projected demand for electricity and liquid fuel source energies. A mixture of sources will be required in the coming years to meet growing energy demand across the state. Two energy generation scenarios were explored for Hawai‘i’s CAP:

- Scenario 1: a conservatively ambitious renewable energy implementation scenario under which several energy technologies are implemented across the islands to reduce fossil fuel use in electricity production, as summarized in the following tables.
- Scenario 2: a fossil fuel dependent scenario under which all new electricity generation is provided by diesel.

⁸⁷ Hawai‘i State Energy Office. (2025, January). *Alternative Fuel, Study* (p. 29).

⁸⁸ Kaua‘i Island Utility Cooperative. (2022). *2022 Annual Report* (p. 4). Retrieved from https://kiuc.coop/sites/default/files/documents/annual_reports/2022%20Annual%20Report_web.pdf

⁸⁹ Kaua‘i Island Utility Cooperative. (2022). *2022 Annual Report*

Scenario 1	Hawai'i				Maui			
	2030	2035	2040	2045	2030	2035	2040	2045
Biodiesel	0	0	0	81	0	0	0	190
Biomass	0	0	0	0	0	0	0	0
Distributed solar PV	295	336	371	397	342	386	475	683
Fossil	15	74	158	0	83	165	235	0
Geothermal	248	267	275	566	0	0	0	0
Hydro	47	47	47	47	0	0	0	0
Natural gas	0	0	0	0	0	0	0	0
Onshore wind	106	351	552	552	221	274	426	557
Utility solar PV	576	579	614	659	666	741	741	741
Waste incineration to energy	0	0	0	0	0	0	0	0
Renewable natural gas	0	0	0	0	0	0	0	0
Total	1287	1654	2017	2302	1312	1566	1877	2171

Table 5: Modeled Electricity Generation for Hawai'i and Maui in Milestone Years.

Hawai'i Island sees powerplant biodiesel use arrive between 2040 and 2045 to replace remaining fossil fuel use. Distributed and power plant solar PV steadily increased over the period. Geothermal energy more than doubles from expected 2030 levels, and onshore wind increases five-fold. It is important to note that these models select technologies based on projected levelized costs and resource needs and are preliminary; once resource planning and modeling are completed, community outreach and assessment of willingness to adopt the proposed technology capacities must follow. As an example, while the models indicate a need for geothermal capacity to double on Hawai'i Island, that does not necessarily mean a project will be built.

Maui Island sees increases in distributed and utility solar PV generation, as well as a large increase in onshore wind power. Biodiesel will replace remaining fossil fuel generation by 2045.

Scenario 1	O'ahu				Kaua'i			
	2030	2035	2040	2045	2030	2035	2040	2045
Biodiesel	0	0	0	0	0	0	0	2.41
Biomass	0	0	0	0	3.40	3.27	3.41	2.45
Distributed solar PV	1,829	2,743	3,124	3,124	7.89	8.88	9.59	9.94
Fossil	2,242	70	97	0	2.50	2.76	3.42	0
Geothermal	0	0	0	0	0	0	0	0
Hydro	0	0	0	0	6.44	6.46	6.47	6.35
Natural gas	368	1,000	500	0	0	0	0	0
Onshore wind	1,036	986	927	904	0	0	0	0
Utility solar PV	1,395	2,264	3,225	3,882	40.17	43.46	47.94	55.7
Waste incineration to energy	582	582	582	584	0	0	0	0
Renewable natural gas	0	1013	2135	3570	0	0	0	0
Total	7,452	8,708	10,699	12,196	60.4	64.8	70.8	76.9

Table 6: Modeled Electricity Generation for O'ahu and Kaua'i Islands in Milestone Years.

O'ahu has large, continued energy use growth that is not met by renewables alone under Scenario 1. Despite added solar and wind capacity, natural gas use grows even as other fossil fuel generation is phased out. O'ahu is the only island with renewable natural gas considered, which can be used to displace natural gas. Kaua'i's biomass and fossil fuel generation decrease under this scenario, replaced with solar PV over the years and biodiesel in 2045.

Scenario 1	Lana'i				Moloka'i			
	2030	2035	2040	2045	2030	2035	2040	2045
Biodiesel	0	0	0	0.14	0	0	0	0.11
Biomass	0	0	0	0	0	0	0	0
Distributed solar PV	0.22	0.27	0.3	0.33	0.76	0.85	0.91	1.12
Fossil	0.14	0.15	0.16	0	0.32	0.31	0.3	0
Geothermal	0	0	0	0	0	0	0	0
Hydro	0	0	0	0	0	0	0	0
Natural gas	0	0	0	0	0	0	0	0
Onshore wind	0	0	0	0	0	0	0	0
Utility solar PV	3.43	3.57	3.82	4.06	3.07	3.43	3.97	4.49
Waste incineration to energy	0	0	0	0	0	0	0	0
Renewable natural gas	0	0	0	0	0	0	0	0
Total	3.8	4.0	4.3	4.5	4.2	4.6	5.2	5.7

Table 7: Modeled Electricity Generation for Lana'i and Moloka'i in Milestone Years.

Lāna‘i’s existing fossil fuel generation is ramped down by 2045, replaced by solar PV. Biodiesel replaces any remaining fossil fuel use in 2045. Moloka‘i’s fossil fuel electricity generation is also replaced with solar PV, as well as biodiesel in 2045. The table below summarizes the total energy generation modeled for all islands.

Scenario 1	Total energy by source (GWh)			
GWh	2030	2035	2040	2045
Biodiesel	0	0	0	273.66
Biomass	3	3	3	2
Distributed solar PV	2,475	3,475	3,981	4,215
Fossil fuel	2,343	312	493	0
Geothermal	248	267	275	566
Hydro (run-of-river)	53	53	53	53
Natural gas	368	1,000	500	0
Onshore wind	1,363	1,661	2,014	2,145
Utility solar PV	2,683	3,634	4,636	5,346
Waste incineration to energy	582	528	582	584
Total	10,120	12,002	14,674	16,756

Table 8: Total Energy Generation by Source for all of Hawai‘i State in Milestone Years.

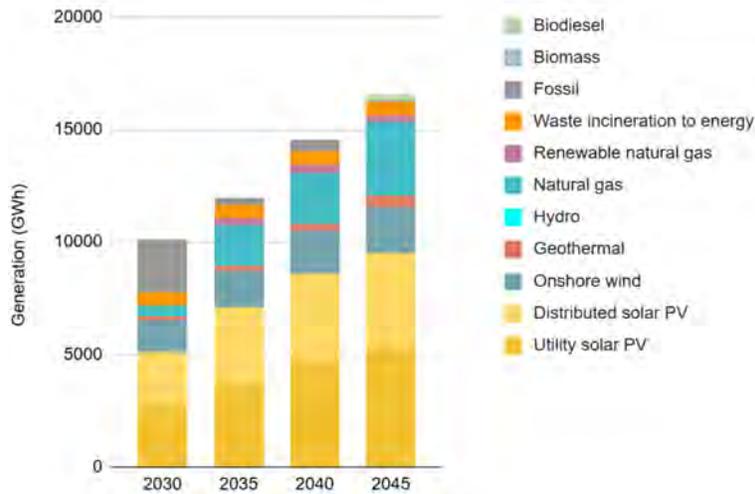


Figure 12: Total Energy Generation by Source for the State in Milestone Years.

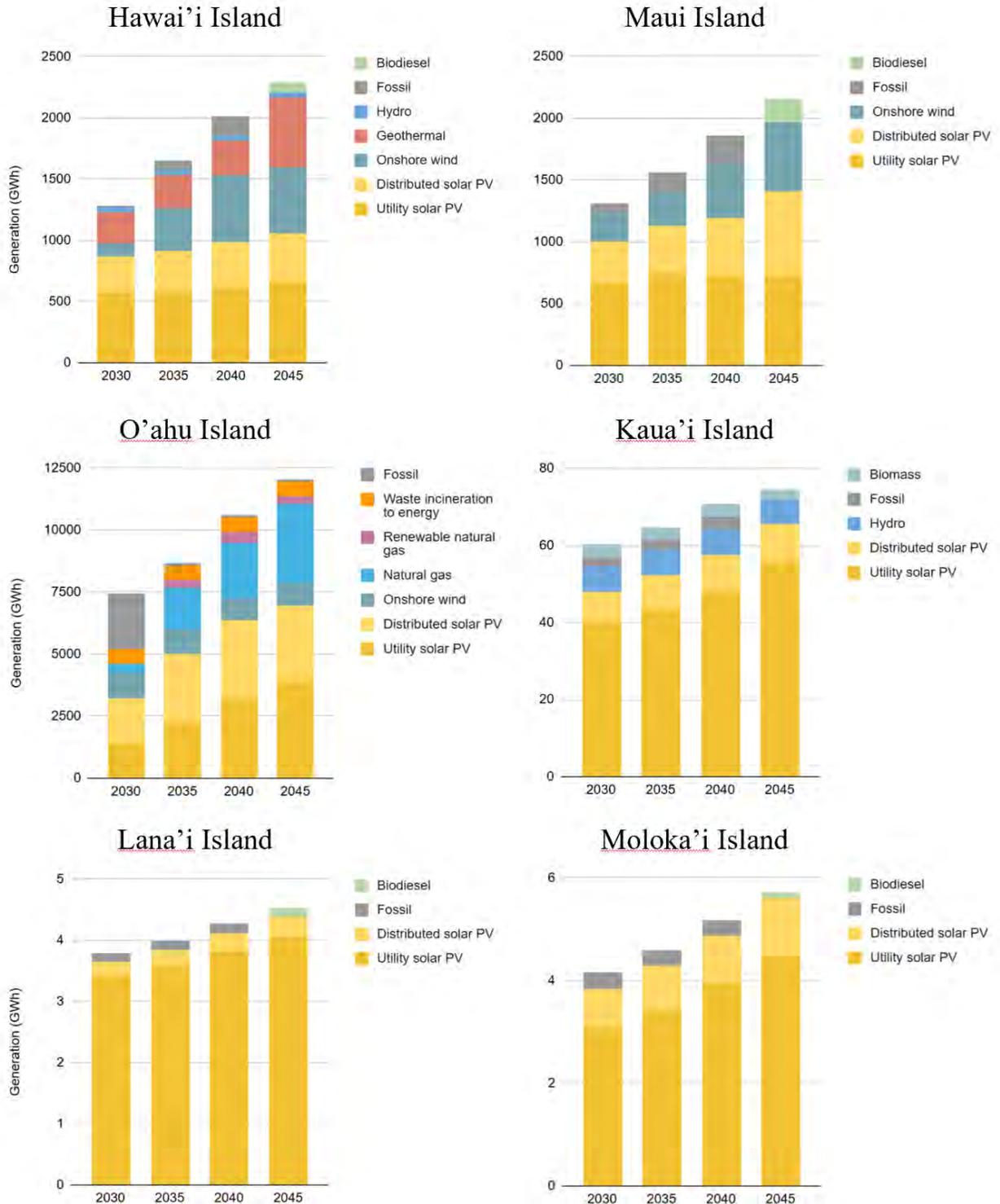


Figure 13: Modeled Energy Generation by Source for Each Major Island in Milestone Years. Note the Scale Differences Between Charts on the Vertical Axes.

Emissions from Energy Use

Each electricity-generating power plant that uses fossil fuels has a different emission factor (the amount of GHG emissions produced per gallon of fuel used). The table below summarizes the emission factors for each electricity generation type on each island.

Emission Factors (MT CO ₂ e/GWh) (from DLNR and eGRID)						
Source	Hawai'i	Maui	O'ahu	Kaua'i	Lāna'i	Moloka'i
Biodiesel	213	213	213	213	213	213
Biomass	-	-	40	40	-	-
Distributed solar PV	0	0	0	0	0	0
Fossil fuel	865	764	766	744	764	764
Geothermal	0	0	0	0	0	0
Hydro (run-of-river)	0	0	0	0	0	0
Natural gas	-	-	466	-	-	-
Onshore wind	0	0	0	0	0	0
Utility solar PV	0	0	0	0	0	0
Waste incineration to energy	-	-	1046	-	-	-
Renewable natural gas	-	--	309	-	-	-

Table 9: Emission Factors for Each Electricity Generation Source, by Island.

The following table and chart summarize the state's total emissions under the two scenarios.

MMT CO2e Source	Scenario 1 Total Emissions				Scenario 2 Total Emissions			
	2030	2035	2040	2045	2030	2035	2040	2045
Biodiesel	0	0	0	0.06	0	0	0	0
Biomass	0	0	0	0	0	0	0	0
Distributed solar PV	0	0	0	0	0	0	0	0
Fossil fuel	1.80	0.25	0.39	0	1.80	2.79	5.25	7.26
Geothermal	0	0	0	0	0	0	0	0
Hydro (run-of-river)	0	0	0	0	0	0	0	0
Natural gas	0.17	0.47	0.23	0	0.17	0.47	0.23	0
Onshore wind	0	0	0	0	0	0	0	0
Utility solar PV	0	0	0	0	0	0	0	0
Waste incineration to energy	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61
Renewable natural gas	0.00	0.31	0.66	1.10	0	0	0	0
Total	2.58	1.63	1.89	1.77	2.58	3.37	3.43	3.38
Cumulative 2030-2045				30.65				81.14

Table 10: Comparison Of Emissions Between a Renewable Energy Adoption Scenario and a Scenario in Which All Post-2030 New Electricity Generation Is Supplied by Diesel, in Milestone Years.

The total, cumulative, year-over-year avoided emissions of the conservative renewable energy adoption scenario is 50.49 MM TCO2e.

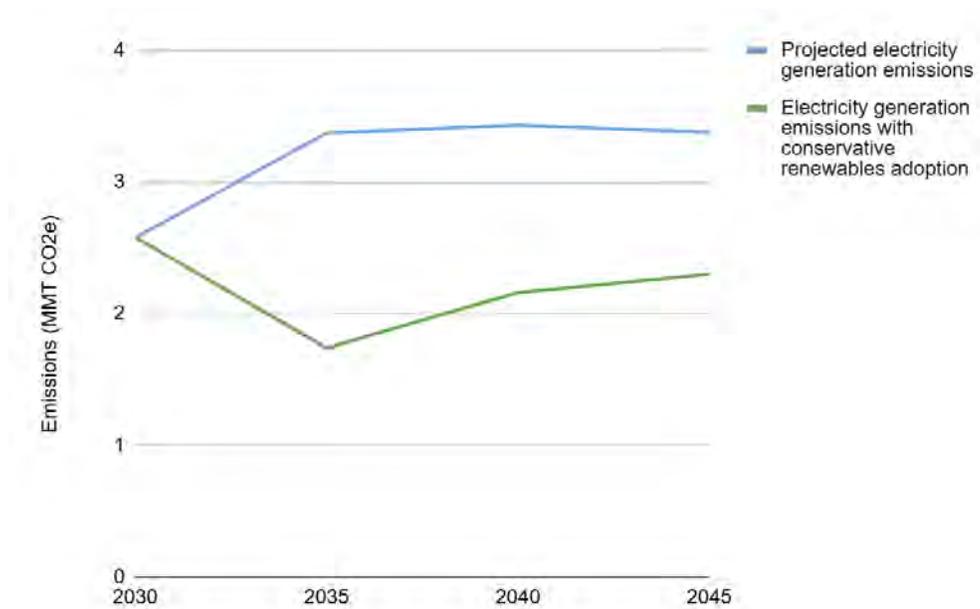


Figure 14: Comparison of Emissions Between a Conservative Renewable Energy Adoption Scenario and a Scenario in Which all Post-2030 New Electricity Generation is Supplied by Diesel.

7.7 Key implementing agency (or agencies)

The energy transition in Hawai‘i involves a diverse array of stakeholders, each playing a crucial role:

The Hawai‘i Public Utilities Commission (PUC) serves as a central regulatory authority, overseeing the state's utilities under HRS Chapter 269. The PUC is responsible for: reviewing and approving power purchase agreements; regulating electricity generation, transmission, and distribution; approving utility rates; customer protections; Integrated Grid Planning and grid modernization; renewable energy portfolio compliance; electricity reliability standards; electric vehicle (EV) charging services and tariffs; regulating gas utilities; and guiding grid modernization initiatives. The PUC's decisions are instrumental in determining the pace and direction of the energy transition.

Hawai‘i State Energy Office (HSEO) has statutory authority to guide state energy policy and plays an advisory role to the PUC. Under Act 238 (2022) HSEO oversees the statewide decarbonization strategy. HSEO is also responsible for: energy efficiency programs; electric vehicle and clean transportation planning; energy resilience and microgrid policy; renewable energy planning; and provides essential data, analysis, and policy recommendations.

Hawai‘i Department of Health (DOH) regulates air pollution, including greenhouse gas (GHG) emissions from electricity generation, fuel refineries, and other energy-sector sources under the Hawai‘i Air Pollution Control Act HRS Chapter 342B, and HAR 11-60.1. DOH issues air permits for power plants and provides enforcement of the federal Clean Air Act for stationary sources. DOH is responsible for the statewide GHG inventory.

Department of Commerce and Consumer Affairs (DCCA), Hawai‘i Office of Consumer Advocacy represents ratepayers in energy regulatory proceedings and intervenes in PUC cases involving utility rates, grid planning, renewable projects, and EV programs under HRS §269-51.

Hawai‘i Climate Change Mitigation and Adaptation Commission (CCMAC) is responsible for recommending overarching greenhouse gas (GHG) reduction targets for the state.

Hawaiian Electric Company (HECO) and Subsidiaries: HECO, along with its subsidiaries Maui Electric and Hawai‘i Electric Light, provides electricity to approximately 95% of Hawai‘i's population across O‘ahu, Maui, Lāna‘i, Moloka‘i, and Hawai‘i Island. As the primary utility, HECO's investment strategies, grid modernization plans, and renewable energy procurement efforts are central to the state's energy transformation.

Kaua‘i Island Utility Cooperative (KIUC): KIUC is a unique, member-owned cooperative serving Kaua‘i. It has distinguished itself as a leader in renewable energy integration, achieving high levels of renewable penetration significantly ahead of state targets. KIUC achieved 51% renewable energy for its generation mix in 2024 and has set an ambitious goal to reach 100%

renewable energy by 2033, accelerating the state's 2045 timeline by more than a decade.⁹⁰ Its cooperative model offers valuable insights into community-centric energy development.

Office of Planning and Sustainable Development (OPSD) Under Act 187 OPSD is conducting an Integrated Land Use Study to determine how much land is needed statewide to meet statutory sustainability, climate adaptation, energy, agriculture, and housing mandates through 2050 (e.g., Acts 151, 175, and 176 for local food, 100% renewable energy by 2045, and long-term affordable housing goals).

The Department of Land and Natural Resources (DLNR) provides environmental oversight of utility scale renewable energy projects through its Board of Land and Natural Resources State Historic Preservation Division and Office of Conservation and Coastal Lands.

Independent Power Producers (IPPs): IPPs are vital to the state's renewable energy growth, developing and operating large-scale renewable energy projects such as solar farms, wind farms, and geothermal plants. They sell the generated power to utilities under long-term power purchase agreements, contributing significantly to the state's renewable energy supply.

County Planning and Zoning Authorities: Responsible for zoning approvals for battery storage facilities, and renewable energy infrastructure and building permits for rooftop PV, solar water heating systems, EV chargers, and energy-efficiency upgrades County Planning and Zoning Authorities play an important role in streamlining energy transition. County planning and zoning offices also ensure projects are aligned with community plans and provide Special Use Permits for renewable energy projects on Agricultural or Preservation lands and environmental and shoreline review (SMA) for coastal-area renewable or resilience projects. Authorities include City and County of Honolulu's Department of Planning and Permitting (DPP), Hawai'i County Planning Department, Hawai'i County Department of Public Works – Building Division, Maui County Department of Planning, and Kaua'i County Planning Department.

County Property Tax Authorities: Administer property tax exemptions and valuations for renewable energy systems (e.g., home solar power systems) and determine how renewable system installation affects property valuation. The County Property Tax authorities work to balance community benefit from locally produced energy with community benefit from property tax revenue. City and County of Honolulu's Real Property Assessment Division (RPAD), Hawai'i County Department of Finance, Real Property Tax Division, Maui Department of Finance Real Property Assessment Division and Kaua'i County Department of Finance Real Property Assessment Division.

Community and Environmental Groups: These groups are increasingly influential in project siting decisions, land use planning, and advocating for equitable benefits from the energy transition. Their engagement is critical for ensuring that renewable energy development aligns with community values and environmental protection. HSEO and the PUC actively seek community input through various engagement activities, including public webinars and

⁹⁰ Kaua'i Island Utility Cooperative. (2022). *2022 Annual Report* (p. 4).
https://kiuc.coop/sites/default/files/documents/annual_reports/2022%20Annual%20Report_web.pdf

stakeholder discussions, to ensure that decarbonization solutions are implemented in a manner that is "pono" (righteous) and effectively manages the cost of living while improving the quality of life in the islands.⁹¹

Federal Energy Regulators: The state is bound by federal law and must abide by federal regulations. **U.S. Environmental Protection Agency (EPA)** sets power plant emission limits for criteria air pollutants and emissions from stationary sources, and the State DOH is responsible for permitting and enforcement. Similarly, the EPA sets hazardous waste rules and the State DOH is responsible for regulation under cooperative federalism. The **U.S. Department of Energy (DOE)** shapes Hawai‘i’s energy transition through research, national energy policy priorities, grid resilience programs, appliance efficiency standards, and significant federal funding mechanisms, through various grant programs and the Loan Program Office. The **Federal Energy Regulatory Commission (FERC)** primarily regulates electricity that crosses state lines, since Hawai‘i’s grids are isolated it is mostly exempt from FERC’s jurisdiction. However, FERC could license certain hydropower facilities (although the requirement to submit is unlikely because hydroelectric potential is limited and Hawai‘i streams do not generally meet the criteria for FERC jurisdiction. FERC has jurisdiction over the interstate aspects of LNG, including the construction and operation of import/export facilities (applicable to Hawai‘i if LNG is imported), and pipelines transporting gas across state lines (not applicable to Hawai‘i). FERC works with other agencies like the U.S. Coast Guard, the U.S. Army Corps of Engineers, and the U.S. Department of Transportation to ensure safety and environmental requirements are met.

⁹¹ Hawai‘i State Energy Office. (2023, December). *Hawai‘i Pathways to Decarbonization*: (p. 4).

7.8 Implementation schedule, milestones, and metrics for tracking progress

RENEWABLE ENERGY		
Action	Schedule	Metrics
Increase renewable energy generation to replace fossil fuel electricity generation	6,441 GWh of generation is added: 1,831 GWh between 2030 and 2035, 2,594 GWh between 2036 and 2040, 2,016 GWh between 2041 and 2045.	Annual increase in GWh of electricity generation output by energy source type. Renewable Portfolio Standard (RPS) percentage. Megawatts (MW) of installed renewable energy capacity (across solar, wind, geothermal, and storage). Million Metric Tons of Carbon Dioxide Equivalent (MMT CO ₂ e) from the electricity sector.
Permitting improvements to meet the renewable portfolio standard (RPS) timelines		Permitting improvements to meet RPS timelines, facilitate community benefits, and explore dispute resolution outside of court.
Efficiency improvements to power plants that use fossil fuels		Efficiency improvements to power plants that use fossil fuels to ensure that power plant replacements significantly reduce energy waste, which will save fuel cost and emissions.

Table 11: Energy Sector Measures Implementation Schedule and Milestones.

7.9 Cost estimates for implementation

Cost estimates for the new energy generation measures presented in section 5.1.6 were calculated under Scenario 1. The change in GWh generation by source was calculated every 5 years (2030-2035, 2035-2040, 2040-2045). *Table 12* provides estimates for the price per GWh of each energy source. Note these are typically average estimates and there are many factors influencing each cost, making a large spectrum for the potential cost of any generation technology. *Tables 13* and *14* show costs per island. *Table 15* summarizes total costs across all islands.

Source ⁹²	\$USD/GWh		
	2035	2040	2045
Biodiesel ⁹³	\$147,166	\$166,410	\$188,077
Biomass	No new biomass		
Distributed solar PV (DSPV)	\$150,000	\$188,000	\$176,720
Fossil	\$220,000	\$227,700	\$235,670
Geothermal	\$80,000	\$80,000	\$80,000
Hydro	No new hydro		
Natural gas	\$70,000	\$72,800	\$75,712
Onshore wind	\$50,000	\$47,000	\$44,180
Utility solar PV (USPV)	\$60,000	\$56,400	\$53,016
Waste incineration to energy	No new incineration		
Renewable natural gas (RNG) ⁹⁴	\$85,304	\$81,038	\$76,986

Table 12: Cost per GWh of Each Energy Source in Milestone Years.

⁹² Unless otherwise noted, costs are sourced from Lazard. (2023) *Levelized Cost of Electricity* <https://www.lazard.com/media/20zoovyg/lazards-lcoeplus-april-2023.pdf>

⁹³ Hawaiian Electric Integrate Grid Plan, Action Plan Annual Update, 2025: https://hawaiipowered.com/igpreport/IGP_Action_Plan_Annual_Update_2025-06-30_Final.pdf

⁹⁴ American Gas Association. July 10, 2025. *New Study: Renewable Natural Gas Is a Cost-Effective, Scalable Tool for U.S. Decarbonization and Energy Security*. Accessed Nov 6, 2025 at <https://www.aga.org/news/news-releases/new-study-renewable-natural-gas-is-a-cost-effective-scalable-tool-for-u-s-decarbonization-and-energy-security>

Note that the cost of \$20/MMBtu quoted in this study has been increased 25% for Hawai‘i, based on direction in Lazard, 2023.

Scenario 1	Hawai'i				Maui				O'ahu			
	2035	2040	2045	Total	2035	2040	2045	Total	2035	2040	2045	Total
Biodiesel	0	0	15	15	0	0	36	36	0	0	0	0
Biomass	0	0	0	0	0	0	0	0	0	0	0	0
DSPV	6	5	3	15	7	13	28	47	137	54	0	191
Fossil	13	19	0	32	18	16	0	34	0	6	0	6
Geo	2	1	23	25	0	0	0	0	0	0	0	0
Hydro	0	0	0	0	0	0	0	0	0	0	0	0
Nat. gas	0	0	0	0	0	0	0	0	44	0	0	44
Wind	12	9	0	22	3	7	6	16	0	0	0	0
USPV	0	2	2	5	5	0	0	5	52	54	35	141
Incineration	0	0	0	0	0	0	0	0	0	0	0	0
RNG	0	0	0	0	0	0	0	0	86	91	110	288
Total	33	36	44	114	32	36	69	137	320	205	145	670

Table 13: Total 5-year Costs of New Energy Generation for Hawai'i, Maui, and O'ahu. Negative numbers for fossil fuels indicate savings as their use decreases.

Scenario 1	Kaua'i				Lāna'i				Moloka'i			
	2035	2040	2045	Total	2035	2040	2045	Total	2035	2040	2045	Total
Biodiesel	0	0	0.45	0.45	0	0	0.03	0.03	0	0	0.02	0.02
Biomass	0	0	0	0	0	0	0	0	0	0	0	0
DSPV	0.15	0.10	0.05	0.29	0.01	0	0	0.02	0.01	0.01	0.03	0.05
Fossil	0.06	0.15	0	0.21	0	0	0	0	0	0	0	0
Geo	0	0	0	0	0	0	0	0	0	0	0	0
Hydro	0	0	0	0	0	0	0	0	0	0	0	0
Nat. gas	0	0	0	0	0	0	0	0	0	0	0	0
Wind	0	0	0	0	0	0	0	0	0	0	0	0
USPV	0.20	0.25	0.41	0.86	0.01	0.01	0.01	0.04	0.02	0.03	0.03	0.08
Incineration	0	0	0	0	0	0	0	0	0	0	0	0
RNG	0	0	0	0	0	0	0	0	0	0	0	0
Total	0.40	0.50	0.91	1.82	0.02	0.02	0.04	0.08	0.04	0.04	0.08	0.15

Table 14: Total 5-year Costs of New Energy Generation for Kaua'i, Lana'i, and Moloka'i.

Scenario 1	Total costs, all islands			
\$ millions	2035	2040	2045	Total
Biodiesel	0	0	51	51
Biomass	0	0	0	0
DSPV	150	71	31	252
Fossil	31	41	0	72
Geo	2	1	23	25
Hydro	0	0	0	0
Nat. gas	44	0	0	44
Wind	15	17	6	37
USPV	57	56	38	151
Incineration	0	0	0	0
RNG	86	91	110	288
Total	385	277	260	922

Table 15: Total 5-year Estimated New Energy Generation Costs for all Islands, for Scenario 1.

Net energy generation costs for all islands between 2030 and 2045 are estimated to be \$922M in Scenario 1. Costs are visualized in the following figure. 2035 and 2045 feature large cost savings as generation shifts away from fossil fuels (typically diesel) toward renewable energy.

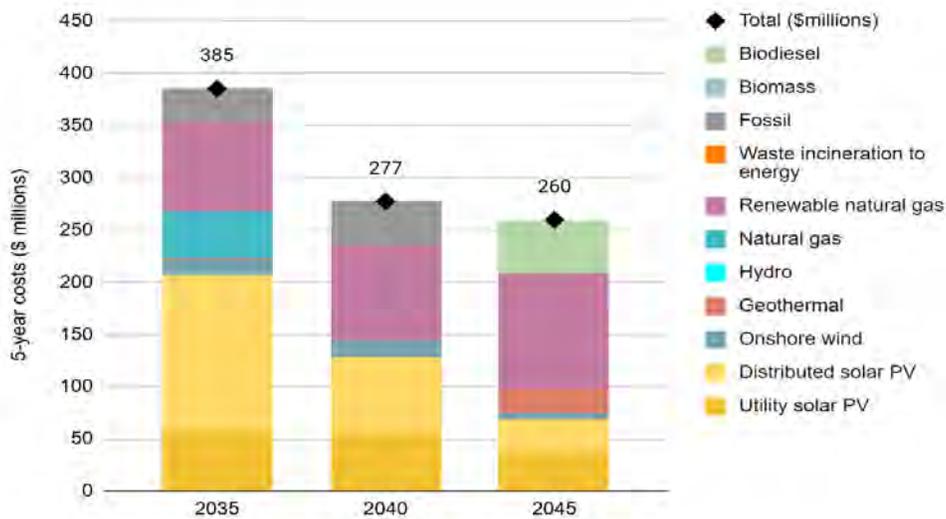


Figure 15: Total 5-year New Energy Generation Costs for Scenario 1. Black Diamonds Indicate Net Cost.

Scenario 2 looks at continued fossil fuel use without additional renewable energy coming online. This pathway is estimated to cost a total of \$1.65 billion spent on energy generation, given the

assumed cost of fossil fuel-fired generation (*Table 16*). This results in \$728 million more expended than the renewable energy pathway in Scenario 1.

Scenario 2	Total, all islands			
\$million	2035	2040	2045	Total
Fossil	\$319	\$722	\$608	\$1,650

Table 16: Total 5-year Estimated New Energy Generation Costs for all Islands, for Scenario 2.

7.10 Funding sources

Sustainable, green energy funding has been dramatically cut by the current administration. While there has been some success by states and organizations in resecuring funding that were rescinded by the government, other programs have been cut and not restored. This includes programs that would have helped the State move towards its clean energy goals such as \$62.5 million for the Solar For All funding from the EPA and six projects funded by the Department of Energy for grid reliability and microgrids totaling \$67 million. The landscape for energy funding has dramatically changed during 2025, with significantly few federal funding opportunities for renewable energy and an increase in coal mining and funds used to expand fossil fuel-based energy per the “Unleashing American Energy” Executive Order (EO 14154).

Federal Funds

The Department of Energy (DOE) has many programs to fund and support energy security transition including;

- Hydropower Technical Collaboration Program supports hydropower, pumped storage hydropower, and marine energy innovations by helping participants develop and test advanced manufacturing techniques and new water-power technologies.⁹⁵
- DOE’s State Energy Program (SEP) formula funds provide flexible federal support that states can use to advance energy efficiency, renewable energy deployment, and clean energy planning. In Hawai‘i these funds can help scale priority projects such as building electrification, grid modernization, and community-level resilience initiatives.⁹⁶
- DOE maintains Partnership Intermediary Agreements (PIAs) with three separate partner organizations: EnergyWerx, TechWerx, and ConnectWerx. These partnership intermediaries (PIs) increase cooperative and joint activities between DOE and small business firms, institutes of higher education, non-traditional performers, and innovative collaborators enabling the rapid development, scaling, and commercialization of relevant technologies and solutions. EnergyWERX Industrial Assessment Centers (IAC)

⁹⁵ U.S. Department of Energy New Advanced Manufacturing Opportunity for Hydropower Projects, accessed November 5, 2025, <https://www.energy.gov/eere/water/articles/new-advanced-manufacturing-opportunity-hydropower-projects>

⁹⁶ National Archives Code of Federal Regulations, accessed November 5, 2025, <https://www.ecfr.gov/current/title-10/chapter-II/subchapter-D/part-420/subpart-B/section-420.11>

Implementation Grants, offering applicants up to several hundred thousand dollars per facility, help industrial and manufacturing sites implement recommended energy-efficiency, decarbonization, and productivity improvements. These funds can support upgrades such as advanced controls, efficient equipment, process optimization, and onsite clean-energy technologies that reduce both emissions and operating costs.⁹⁷

- The National Laboratory of the Rockies (NLR) U.S. Department of Energy's primary national laboratory for energy systems. Their managed Energy to Communities (E2C) Program supports state, local, and Tribal governments with technical assistance and funding to plan and deploy clean energy projects including grid upgrades, renewable generation, building electrification, and transportation-electrification efforts. In recent rounds, DOE has committed up to \$50 million to support in-depth community energy transitions through this program.⁹⁸
- The Office of the State and Community Energy Programs (SCEP) provides funding and technical assistance to help states, territories, and local communities advance clean energy, energy efficiency, and resilience priorities. These resources can be used to support programs such as building decarbonization, community energy planning, workforce development, and deployment of distributed energy technologies that reduce costs and strengthen local resilience.⁹⁹
- The Testing Expertise and Access for Marine Energy Research (TEAMER) program provides technical support and access to world-class facilities so marine energy developers can carry out numerical modeling, lab or tank/flume testing, and open-water trials. In recent rounds, TEAMER has awarded over \$2.3 million (in RFTS 15) and more than \$2.7 million (in RFTS 16) to support a broad set of marine-energy technology testing projects.¹⁰⁰
- The National Science Foundation (NSF) program Energy, Power, Control, and Networks (EPCN) provides grants to support research and development in advanced energy and power systems, including grid integration of renewables, microgrids, electric and hybrid vehicles, energy storage, power-electronics, and cybersecurity for power networks. Typical award amounts for EPCN grants are in the range of approximately \$350,000 to \$400,000 for single-institution projects, while larger collaborative proposals can receive around \$500,000–\$550,000.¹⁰¹

State Funds

The Hawai'i Renewable Energy Technologies Income Tax Credit (RETITC) lets individuals or corporations claim a state income-tax credit for eligible solar or wind energy systems installed in Hawai'i, for example, 35% of the cost for solar PV or solar-thermal systems, or 20% for wind

⁹⁷ Industrial Training & Assessment Centers Implementation Grants, accessed November 5, 2025, <https://www.energywerx.org/itac>

⁹⁸ National Laboratory of the Rockies, State, Local, & Tribal Governments Energy to Communities Program, accessed November 5, 2025, <https://www.nrel.gov/state-local-tribal/clean-energy-to-communities.html>

⁹⁹ Office of State and Community Energy Programs, accessed November 5, 2025, <https://www.energy.gov/scep/office-state-and-community-energy-programs>

¹⁰⁰ Teamer Request for Technical Support from the Testing Expertise and Access for Marine Energy Research Program Application, accessed December 5, 2025, <https://teamer-us.org/application/>

¹⁰¹ U.S. National Science Foundation Energy, Power, Control and Networks, accessed Nov. 5, 2025, <https://www.nsf.gov/funding/opportunities/epcn-energy-power-control-networks>

systems. The credit is capped depending on property type: for a single-family home, the maximum for a photovoltaic system is \$5,000; for solar water-heating systems, the cap is \$2,250 per system.¹⁰²

County Funds

The County of Maui Green Grants Program offers targeted funding to support renewable-energy, energy-efficiency, for FY 2025, the program allocates \$100,000 to its Renewable Energy Grant stream.¹⁰³

Public-Private & Philanthropic Partnerships

Hawai‘i Community Foundation: HCF’s Ka Papa o Kākuhihewa Fund provides grants, typically between \$1,000 and \$10,000, to nonprofit and community-based organizations focused on natural resource conservation, environmental education, renewable energy, land stewardship, and sustainability.¹⁰⁴

Resources Legacy Fund (RLF): RLF provides grants and fiscal sponsorship to support conservation, clean-energy, and climate-resilience initiatives, including efforts to accelerate the clean-energy transition while protecting ecosystems and supporting environmental justice. RLF distributes substantial funding: in its most recent fiscal year it awarded more than \$35 million to over 280 organizations working on climate, energy, conservation, and community resilience projects.¹⁰⁵

Stantec Community Investment Program: This program provides grants and in-kind support to nonprofit and community organizations, including those working on environmental sustainability, energy efficiency, and resilience projects. Funding amounts vary depending on the project and organization; Stantec supports a wide range of environmental and community-development efforts through annual contributions tied to roughly 1% of its pretax profits.¹⁰⁶

Ulupono Initiative: As a key impact investor in Hawai‘i, Ulupono actively funds projects in local food production, renewable energy, and waste reduction. Their support can be leveraged to provide the “matching funds” often required for federal grants.¹⁰⁷

¹⁰² State of Hawai‘i Department of Taxation Renewable Energy Technologies Income Tax Credit, accessed December 5, 2025, <https://tax.Hawai‘i.gov/geninfo/renewable/>

¹⁰³ County of Maui Green Grants, accessed December 5, 2025, <https://mauigreengrants.grantplatform.com/>

¹⁰⁴ Hawai‘i Community Fund Ka Papa o Kahuhihewa Fund, accessed Dec 5, 2025, <https://www.Hawai‘icomunityfoundation.org/strengthening/island-by-island/ka-papa-o-kakuhihewa-fund>

¹⁰⁵ Resource Legacy Fund, accessed December 5, 2025, <https://resourceslegacyfund.org/>

¹⁰⁶ Stantec Community Investment Program, accessed December 5, 2025, <https://www.stantec.com/en/about/community-engagement>

¹⁰⁷ Ulupono Initiative Funding, accessed December 5, 2025, <https://ulupono.com/what-we-do/what-we-fund/>



8. Buildings and Energy Efficiency

MEASURES

5. DISTRIBUTED SOLAR PV

6. BUILDING ENERGY EFFICIENCY AND UPGRADES

7. BUILDING RESILIENCE UPGRADES

8. NEW BUILDING CODES

8. Buildings and Energy Efficiency

8.1 Overview

Energy efficiency and conservation are the single most important and most cost-effective measure to meaningfully reduce electricity demand.¹⁰⁸ The state faces the highest average electricity prices in the nation, more than triple the U.S. average, primarily due to its heavy reliance on imported petroleum, which accounts for approximately 80% of its total energy consumption, the highest share for any state.^{109, 110, 111} This dependence creates significant energy security vulnerabilities and economic burdens for residents and businesses alike. Despite having the third-lowest total energy consumption per capita in the U.S. states the household electricity burden, the percentage of household income spent on electricity bills, is one of the key elements contributing to a household's energy insecurity.¹¹² Households experiencing energy insecurity may be forced to choose between spending on basic necessities such as food and medicine and paying their energy bills and higher temperatures mean more resident need air conditioning to maintain livable temperatures. The imperative for energy efficiency remains.¹¹³

The buildings sector is a major energy consumer and contributor to greenhouse gas (GHG) emissions across the islands.¹¹⁴ Energy efficient buildings are crucial for minimizing the need for new energy generation infrastructure and reducing emissions associated with electricity generation, thereby serving as a foundational element in the state's decarbonization efforts.¹¹⁵ Hawai'i has a long-standing commitment to clean energy, launching the Hawai'i Clean Energy Initiative (HCEI) in 2008 in partnership with the U.S. Department of Energy to reduce dependence on imported fossil fuels. This initiative set a foundational goal of meeting 70% of the state's energy needs through renewable energy (40%) and energy efficiency (30%) by 2030.¹¹⁶ The significant reliance on imported petroleum and the resulting highest electricity prices underscore that energy efficiency is not merely an environmental objective but a critical energy security and economic affordability imperative for Hawai'i. This fundamental understanding means that energy efficiency efforts are aimed at stabilizing the economy, improving residents' quality of life, and enhancing the state's self-sufficiency and resilience against external energy shocks.

¹⁰⁸ Hawai'i State Energy Office. (2023, December). *Hawai'i Pathways to Decarbonization*: (p. 10).

¹⁰⁹ U.S. Energy Information Administration. *Hawai'i Profile*. <https://www.eia.gov/state/print.php?sid=HI>

¹¹⁰ EBSCO. *Hawaii's Energy Consumption*. <https://www.ebsco.com/research-starters/power-and-energy/hawaiis-energy-consumption>

¹¹¹ Department of Business, Economic Development & Tourism. *Energy Data Report 2023*. State of Hawai'i, 2023, p.4. https://files.hawaii.gov/dbedt/economic/data_reports/reports-studies/Energy_Data_Report_2023.pdf

¹¹² Center on Global Energy Policy, Columbia University School of International and Public Affairs (October 2023) "Energy Insecurity in the United States, Fact Sheet"

¹¹³ US Energy Information Administration, Rankings: Energy Consumed per Capita, 2022, <https://www.eia.gov/state/rankings/>

¹¹⁴ City and County of Honolulu, Office of Climate Change, Sustainability and Resiliency. *Honolulu Better Buildings Benchmarking Program*. Accessed June 7, 2025. <https://www.resilientoahu.org/benchmarking>

¹¹⁵ Hawai'i Public Utilities Commission. *Hawai'i's Renewable Energy and Energy Efficiency Policies*. <https://puc.hawaii.gov/energy/hawaiis-renewable-energy-and-energy-efficiency-policies/>

¹¹⁶ Hawai'i State Energy Office. *Hawai'i Clean Energy Initiative*. <https://energy.hawaii.gov/hawaii-clean-energy-initiative/>

Hawai‘i is poised to accelerate buildings and energy-efficiency upgrades, with more than five million dollars in shovel-ready projects ranging from public-library efficiency improvements to a statewide affordable-housing retrofit program that lowers utility costs for families. As an early leader in rooftop solar adoption, the state now faces a wave of aging systems, prompting active planning for responsible end-of-life recycling of panels and lithium-ion batteries. Additional projects ready to move forward include community-scale solar installations for Department of Hawaiian Home Lands (DHHL) homesteads and small-business facilities, further strengthening Hawai‘i’s clean-energy resilience and reducing long-term energy burdens across the islands.

8.2 Key Features

Hawai‘i’s approach to building energy efficiency is anchored in a progressive regulatory framework and a commitment to continuous improvement. The state has systematically updated its building energy codes to align with national standards while incorporating local amendments, recognizing that robust codes are the most cost-effective means of reducing energy use in new construction and major renovations.¹¹⁷

The Hawai‘i State Building Code Council (SBCC) adopted the 2018 International Energy Conservation Code (IECC) with amendments in December 2020. As of 2024, all four counties—Honolulu, Hawai‘i, Maui, and Kaua‘i, have adopted the 2018 IECC, some with additional county-specific amendments. This ensures a consistent, yet adaptable, statewide standard for new construction. This represents a significant advancement from previous codes, such as the 2015 IECC (which counties adopted with their own amendments) and the pre-2015 codes that had limited residential requirements and older commercial standards. The systematic adoption of newer IECC versions and the forward-looking goal for zero net energy (ZNE) codes by 2030 demonstrate a clear, progressive policy trajectory. The fact that all four counties have adopted the 2018 IECC, even with county-specific amendments, indicates a pragmatic balance between statewide ambition and local flexibility, which is crucial for effective implementation across diverse island contexts. This distributed implementation model can lead to greater buy-in and more effective enforcement, providing a strong regulatory backbone for achieving energy efficiency targets and signaling to developers and industry that Hawai‘i is serious about long-term decarbonization in the built environment.

While codes primarily address new construction, Hawai‘i recognizes the critical need to improve the efficiency of its existing building stock. The state has joined the National Building Performance Standard (BPS) Coalition, committing to initiate state building retrofits and advance legislation or regulation by April 2026 to improve building standards for large commercial buildings.¹¹⁸ The

¹¹⁷ Hawai‘i State Energy Office. *Hawai‘i Building Energy Code*. Accessed June 7, 2025. <https://energy.hawaii.gov/hawaii-building-energy-code/>

¹¹⁸ Hawai‘i State Energy Office. *Governor Josh Green, M.D. Joins National Building Standards Coalition to Improve Buildings and Lower Energy Costs*. Accessed June 7, 2025. <https://energy.hawaii.gov/governor-josh-green-m-d-joins-national-building-standardscoalition-to-improve-buildings-and-lower-energy-costs/>

goal is for the International Codes Council (ICC) to adopt zero net energy (ZNE) codes by 2030, which Hawai‘i aims to integrate. ZNE buildings minimize energy use and produce an equivalent amount of energy on-site or off-site, typically through solar and wind. The Hawai‘i State Energy Office (HSEO) provides extensive training and resources to help professionals comply with current energy codes, including webinars and educational modules, further supporting collaborative implementation efforts involving the SBCC, county Corporation Councils, County Council hearings, and local enforcement agencies.

8.3 Numbers and Targets: Current Status and Future Goals

The building sector on O‘ahu alone accounts for approximately one-third of the island's total greenhouse gas emissions.¹¹⁹ Analysis of commercial building energy use indicates that buildings over 50,000 square feet, which constitute only 25% of commercial buildings, account for a disproportionately high 79% of energy use and 78% of emissions in this sector.¹²⁰ Within this segment, lodging buildings alone consume 49% of the energy used by commercial buildings over 50,000 square feet. This disproportionate impact means that policy interventions focused on a smaller subset of buildings, specifically the large ones not built to be energy efficient, could yield substantial results in terms of overall energy savings and GHG reductions, allowing for a more efficient allocation of resources and policy development.

Hawai‘i has set ambitious reduction targets to address these energy consumption and emission levels:

- **Energy Efficiency Portfolio Standard (EEPS):** Established by Act 155 (2009), the statewide EEPS goal was 4,300 GWh of electricity savings by 2030 relative to a 2008 baseline, a goal the state is currently on track to meet.¹²¹ Act 272 (2025) establishes a new target: 6,000 GWh of cumulative persisting electricity savings statewide by 2045.¹²² This extension and increase in the EEPS goal underscore Hawai‘i's long-term commitment to energy efficiency as the most cost-effective way to reduce emissions and provide financial benefits to customers. This increased target reflects a more aggressive, yet realistic, long-term commitment to energy savings, highlighting a strong economic rationale that is crucial for sustained investment and public support.
- **O‘ahu Specific Target:** The Honolulu Better Buildings Benchmarking Program aims to reduce the electricity consumption of large buildings by nearly 7% by 2030.¹²³

¹¹⁹ City and County of Honolulu, Office of Climate Change, Sustainability and Resiliency. *Honolulu Better Buildings Benchmarking Program*. Accessed June 7, 2025. <https://www.resilientoahu.org/benchmarking>

¹²⁰ National Renewable Energy Laboratory. *Commercial and Multifamily Building Energy and Emissions Data for Hawai‘i*. NREL/TP-7A40-86787, 2023, p. 4. <https://docs.nrel.gov/docs/fy23osti/86787.pdf>

¹²¹ Hawai‘i Public Utilities Commission. *Hawai‘i's Renewable Energy and Energy Efficiency Policies*.

¹²² Hawai‘i Public Utilities Commission. *Hawai‘i's Renewable Energy and Energy Efficiency Policies*.

¹²³ City and County of Honolulu, CCSR. *Honolulu Better Buildings Benchmarking Program*.

8.4 Challenges and Innovations

While Hawai‘i demonstrates strong commitment to building energy efficiency, the sector faces unique challenges, particularly its geographic isolation, high material and labor costs, and limited capital available to retrofit its existing building stock, particularly older multifamily condominiums. The state's electricity prices are the highest in the nation, making energy efficiency investments critical but difficult to finance due to high upfront costs.¹²⁴ While new construction is covered by codes, retrofitting the diverse aging existing building stock, especially large commercial ones, presents a significant challenge due to scale, cost, and varied ownership structures.

In response to these challenges, the state is implementing innovative policies and programs focusing on smart energy management, leveraging federal partnerships, and leading by example. Hawai‘i is working to improve BPS for large commercial buildings, which account for 78% of the state's commercial building emissions through its partnership with the National BPS Coalition and the focus on "net zero" ready codes and advanced demand-side management. These actions indicate a move beyond basic energy savings to a more holistic, integrated approach to building decarbonization. This includes not only reducing consumption but also enabling grid flexibility and resilience. This multi-pronged strategy demonstrates Hawai‘i's sophisticated understanding that achieving deep decarbonization in the built environment requires a combination of regulatory updates for new construction, aggressive retrofits for existing buildings, and intelligent grid integration to manage renewable energy variability.

Future IECC measures in Hawai‘i aim to integrate ZNE codes by 2030, which focus on minimizing energy use and producing equivalent energy on-site. This also seeks to reduce "code fatigue" among developers. The state is actively exploring and implementing advanced demand-side management programs, such as demand response programs where customers voluntarily curtail power during supply shortages in exchange for lower utility prices, and time-of-use pricing, which encourages energy use when supply is plentiful. "Demand Response II", where PV batteries or electric vehicles (EVs) can also support demand management.¹²⁵

Hawai‘i is leading by example with projects like the Pearl City Public Library Renovation and Expansion, designed to meet LEED Silver equivalent standards and generate at least 80% of its operating energy from an integrated PV system. HSEO also conducts high-level energy audits and multi-part energy strategies for small and medium-sized state agencies, demonstrating feasibility, building institutional knowledge, and serving as models for the private sector, thereby reducing perceived risk and encouraging broader adoption.

The implementation of benchmarking programs and state-led retrofit projects highlights a commitment to data-driven policy-making and leading by example. Benchmarking provides crucial data on actual building performance, enabling targeted interventions and tracking progress, moving beyond theoretical savings to measurable outcomes.

¹²⁴ U.S. Energy Information Administration. *Hawai‘i Profile*. <https://www.eia.gov/state/print.php?sid=HI>

¹²⁵ Hawai‘i State Energy Office. *Hawai‘i Building Energy Code*. <https://energy.hawaii.gov/hawaii-building-energy-code/>

Nearly 40% of Hawai‘i residents are renters. Landlords are not incentivized to pay for an energy efficiency upgrade, when the tenant receives the benefit of lower utility costs. This leaves the renters with continued high electricity bills. While innovative policy tools like the GEM\$ bill financing program can help LMI homeowners bypass barriers for PV installation and electrification without direct landlord incentives renters have little ability to engage in the program.

8.5 County-Level Variations and Actions

While Hawai‘i sets statewide energy efficiency goals, the implementation and specific programming often occur at the county level, allowing for tailored approaches that address local needs, climate conditions, and community priorities. This decentralized yet coordinated effort is a hallmark of Hawai‘i's climate action strategy.

Each county has developed or participates in distinct initiatives:

- **Honolulu County:** The Better Buildings Benchmarking Program mandates annual reporting of electricity, gas, and water usage for large commercial and multi-family buildings over 25,000 sq ft, with a target to reduce electricity consumption by nearly 7% by 2030. Municipal buildings over 10,000 sq ft are also benchmarked. The City and County of Honolulu's Rehabilitation Loan Program offers low-interest loans to income-eligible homeowners for property repairs, including those that make rooftops solar-ready, and for installing solar water heating and solar PV systems.¹²⁶ O‘ahu's Climate Action Plan (CAP) aims for carbon neutrality by 2045, with strategies to expand energy efficiency and renewable energy infrastructure in the electricity sector.¹²⁷
- **Maui County:** Hawaiian Electric, in partnership with the County of Maui, offers interest-free financing for solar water heaters, which can be combined with state rebates and tax credits. This program is open to all residents with a good payment history.¹²⁸ Maui County achieved a 41.1% Renewable Portfolio Standard (RPS) in 2024.¹²⁹
- **Hawai‘i County:** The county is actively working to optimize energy efficiency in its facilities and is partnering with HSEO to adopt a Building Performance Standard. It also promotes federal tax credits (e.g., Residential Clean Energy Tax Credit, Energy Efficiency Home Improvement Credit) and state-level rebate programs (HEAR, HOMES, HEEHRA) for homeowners, which are administered by the HSEO.¹³⁰
- **Kaua‘i County:** While Hawai‘i Energy administers programs for HECO customers, the Kaua‘i Island Utility Cooperative (KIUC) offers several incentive programs for energy efficiency upgrades for both their residential and commercial members. Generally speaking, the programs will cover a percentage of the cost of materials to encourage members to discard older, less efficient appliances and replace them with new, energy-efficient models,

¹²⁶ Hawai‘i State Energy Office. *Energy Efficiency Programs, Rebates, and Solar Initiatives*. <https://energy.hawaii.gov/what-we-do/financial-assistance-and-grants/financial-assistance-resources/energy-efficiency-programs-rebates-and-solar-initiatives/>

¹²⁷ City and County of Honolulu, CCSR. *O‘ahu Climate Action Plan*. March 1, 2024.

¹²⁸ Hawai‘i State Energy Office. *Energy Efficiency Programs, Rebates, and Solar Initiatives*.

¹²⁹ Hawaiian Electric. *Clean Energy Hawai‘i*. <https://www.hawaiianelectric.com/clean-energy-hawaii>

¹³⁰ Hawai‘i State Energy Office. *Energy Efficiency Programs, Rebates, and Solar Initiatives*.

for refrigeration, cooling and ventilation, lighting, motors, and solar water heaters. KIUC will even provide audits to help its members discover ways they can save energy, reducing the overall pull from the grid and helping everyone use energy more efficiently.

Statewide programs also extend their reach to the counties. Hawai'i Energy administers programs like Energy Smart 4 Homes (ES4H) for Hawai'i, Honolulu, and Maui Counties, providing free energy-efficient products such as LEDs, high-efficiency showerheads, and advanced power strips. It also offers rebates for replacement of water heating, lighting, appliances, and air conditioning with energy efficient appliances across these counties.¹³¹ The High Electrification and Appliance Rebate pathway (HEAR), available late 2025, and the Whole Home Energy pathway (HOMES) will be fully available for Hawai'i residents in 2026. These programs are designed to help low- and moderate-income households with highly energy-efficient appliances and The Federal Weatherization Assistance Program (WAP) also assists low- to moderate-income residents statewide with free weatherization measures that assist in reducing energy needs.¹³² In Hawai'i, WAP funds are used to help low-income households reduce their energy costs by providing energy conservation education and weatherization measures on a statewide basis. Hawai'i is eligible to receive \$317,619.00 in federal funds with additional \$74,582.00 Weatherization Readiness Funds from the U.S. Department of Energy (DOE) through WAP for the July 1, 2025 – June 30, 2026 Program Year (PY) 2025.¹³³

The consistent focus on low- and moderate-income (LMI) households across different counties and program types (rebates, direct installations, bill assistance, financing) demonstrates a systemic effort to address energy equity, actively mitigating the disproportionate impact of high energy costs on vulnerable communities. This ensures that the benefits of energy efficiency, such as reduced energy burden and improved living conditions, are accessible to vulnerable populations. The strong equity component aligns directly with the goals of programs like the EPA's Climate Pollution Reduction Grants (CPRG), which emphasize equitable outcomes and benefits for disadvantaged communities.

The varied approaches taken by each county demonstrate that while the state sets overarching goals, local entities are empowered to implement diverse, tailored strategies. This reflects a strategic understanding that a "one-size-fits-all" approach may not be effective across islands with different demographics, building stocks, and utility structures. Local initiatives can be more responsive to specific community needs and leverage local partnerships. This blend of statewide policy frameworks and localized, diverse implementation strategies allows Hawai'i to maximize the effectiveness of its energy efficiency efforts, adapting to the unique characteristics of each island while collectively contributing to the state's ambitious decarbonization goals.

¹³¹ Hawai'i Public Utilities Commission. *Hawai'i's Renewable Energy and Energy Efficiency Policies*.

¹³² U.S. Department of Energy (DOE) Weatherization Assistance Program.

<https://www.energy.gov/scep/wap/weatherization-assistance-program>

¹³³ Office of Community Services (OCS), Weatherization Assistance Program. <https://labor.hawaii.gov/ocs/service-programs-index/weatherization-assistance-program/>

8.6 Measure Descriptions and GHG reductions

The HSEO has prioritized several emissions reduction and energy efficiency actions for the buildings sector. These aim to make the existing building stock more energy efficient, self-sufficient, and resilient to power outages. They also aim to ensure new buildings are made to high energy efficiency standards and avoid dependency on fossil fuels for their energy needs.

Measure: Reducing Energy Consumption in Existing Buildings

This action aims at implementing rebates and retrofitting existing buildings to decrease energy consumption and reduce energy demand by increasing energy efficiency in residential and non-residential buildings. This action would reduce total energy consumption by 46% by 2040 and 60% by 2050 (Figures 16 and 17).

The primary energy efficiency action in buildings is to address energy use in cooling. This measure involves actions to retrofit building envelopes to make them more airtight, actions to update air-conditioning technologies with modern, energy efficient models, and reduce solar gain by increasing building shading using trees and devices like awnings, and increasing the reflectivity of building walls and roofs

Other energy efficiency actions in the building sector include updating hot water heaters with energy efficient electric models, preferably models that use heat pumps or solar water heating. Replacing outdated lighting is also effective. This transition is happening as current lighting reaches its end-of-life and is replaced with energy efficient LED lights, however the transition could be accelerated with before end-of-life replacement efforts. Some changes to plug loads in buildings can also help with energy efficiency and reducing emissions. Updating appliances with EnergyStar models ensures energy efficiency standards are being met. Refrigeration technologies are the largest energy users in this category.

This action is supported by the statewide Energy Efficiency Portfolio Standard (EEPS) goals to save 4,300 gigawatt-hours of cumulative electricity savings by 2030 (GWh) and 6,000 GWh of cumulative electricity savings by 2045. With this action cumulative savings are expected to be 6,706 GWh by 2050. Other relevant policies that support this action are the development of Building Performance Standards (BPS) and the USDOE's Home Energy Retrofit program.

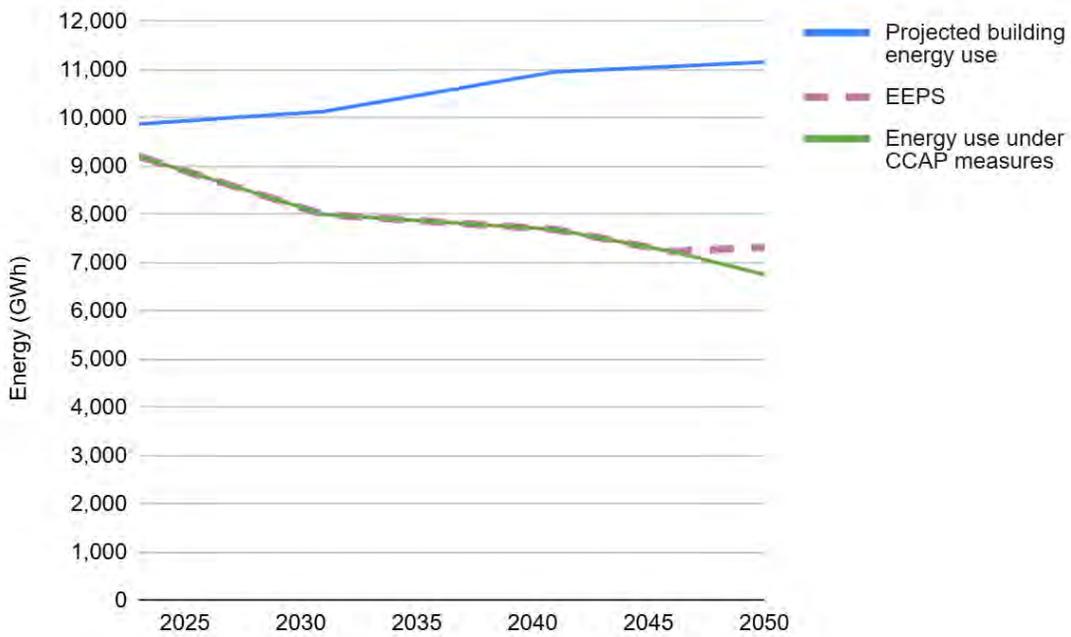


Figure 16: Effects of Efficiency Measures on Total Building Energy Consumption versus Projected Building Emissions and Energy Efficiency Portfolio Standard Target Consumption.

Cumulative CAP scenario energy savings for buildings are shown in the following figure, along with EEPS targets by 2030 and 2045, corresponding to 4,300 GWh and 6,000 GWh.

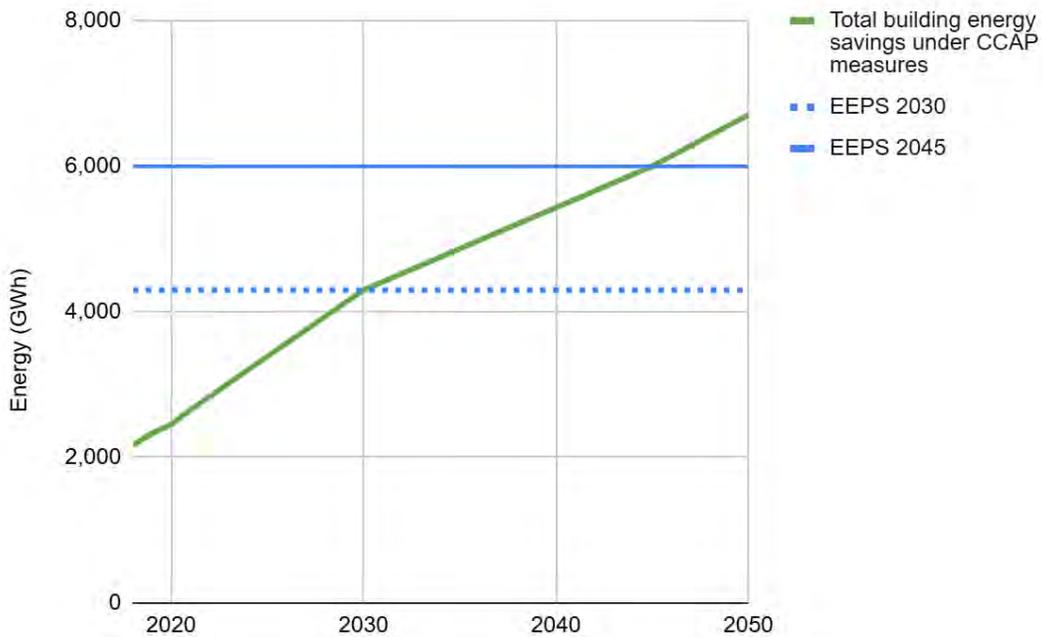


Figure 17: Cumulative Building Energy Savings Relative to EEPS Targets by 2030 and 2045.

Residential Buildings

Hawai‘i residents have been participating in various energy efficiency rebate and retrofit programs and saving money. In 2023, 17,659 residents participated in programs operated by HECO and KIUC. As part of the calculations for this action, the yearly energy savings for 2023 were estimated, yielding an average saving of 3,678 GWh per household. Using this average, the average annual number of households undergoing rebates or retrofitting between 2026 and 2050 is 20,816. At this rate, the total residential units undergoing energy efficiency measures would reach 91% of the residential building stock by 2050. According to the historical residential rebates, this is a realistic target for Hawai‘i.

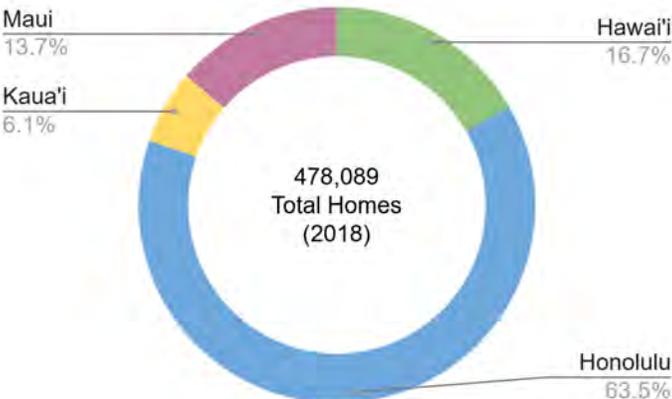


Figure 18: Distribution of homes in the state.

Another relevant stock characterization is the disaggregation of households by county and by income level. As per the State of Hawai‘i Market Potential Study, 63.5% of households in 2018 were in Honolulu.¹³⁴ Considering data from the ALICE reports, poverty and ALICE households are between 21% and 48% of the total household stock, depending on the county (Figure below).¹³⁵

¹³⁴ Hawai‘i Public Utilities Commission (2020, July) State of Hawai‘i Market Potential Study <https://puc.hawaii.gov/wp-content/uploads/2021/02/Hawaii-2020-Market-Potential-Study-Final-Report.pdf>

¹³⁵ ALICE annual reports can be found on the ALOHA United Way website: <https://www.auw.org/about/alice-initiative/alice-reports>

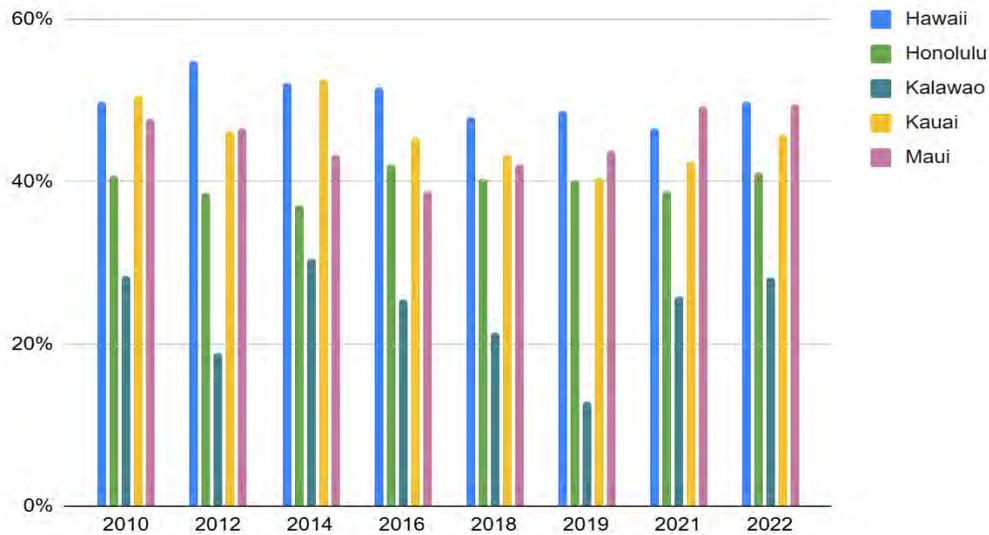


Figure 19: Historical share of poverty and ALICE households per county.

The electricity burden is also characterized by the Department of Business, Economic Development & Tourism through its Electricity Burdens on Hawai‘i Households: 2022 Update report¹³⁶. This report does not consider the ALICE category for households. Instead, it uses the Federal Poverty Level (FPL). For calculations in this report an estimated income level was used for characterizing households’ energy burdens (see table below).

Income Category	Federal Poverty Level (FPL)
Above low income	400% +
	200% - 400%
Low income	150% - 200%
	100% - 150%
	0 - 100%

Table 17: Income categories according to FPL ranges defined for electricity burden calculations.

Considering the income categories, the weighted average energy costs and incomes per household are detailed in the table below. The electricity burden for low-income households are consistently almost 5 times higher than higher income households.

¹³⁶ Department of Business, Economic Development & Tourism. (2022) Electricity Burdens on Hawai‘i Households: 2022 Update’ (2025). https://files.hawaii.gov/dbedt/economic/data_reports/reports-studies/Electricity_Burdens_on_Hawai%E2%80%99i_Households_Jan_2025.pdf

County	Income	Annual energy cost per HH	Annual income per HH	Electricity burden (2022)
Hawai'i	Low Income	\$2,365	\$28,114	8.4%
	Above LI	\$2,579	\$144,306	1.8%
Honolulu	Low Income	\$2,383	\$27,097	8.8%
	Above LI	\$2,686	\$154,082	1.7%
Kaua'i	Low Income	\$2,365	\$28,114	8.4%
	Above LI	\$2,579	\$144,306	1.8%
Maui	Low Income	\$2,528	\$28,630	8.8%
	Above LI	\$2,828	\$153,399	1.8%

Table 18: Electricity burden per county and income category. HH = Household.

Commercial Buildings

The disaggregation of commercial buildings by county and by income level was calculated with numbers from the Market Potential Study. The commercial floor area is mostly located in Honolulu, with 70.2% of the total in 2018 (see figure below).

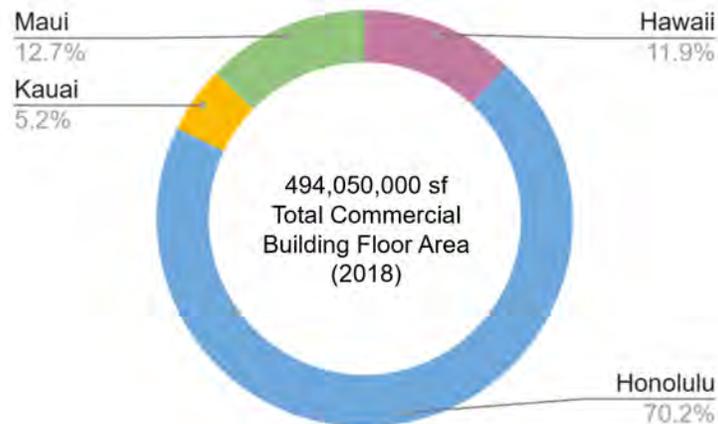


Figure 20: Share of floor area by county in Hawaii.

By projecting the yearly energy savings of the commercial building stock until 2045, with an average of 4.5 kWh per square foot, the average annual commercial floor undergoing rebates or retrofitting is almost 15 million sq ft. With this rate, the total commercial floor area undergoing energy efficiency measures would reach 96% of the commercial building stock. Savings of 4.5 kWh/sq ft amount to 38% of energy reduction from average sales in commercial buildings in 2018. This is equivalent to the economic potential by 2040 from the Market Potential Study.

Measure: Distributed Solar PV Systems

On-site solar PV systems shift home and commercial buildings away from fossil fuel-intensive electricity grid and lower building emissions. As of March 31st, 2025, current policies toward implementing distributed solar capacity have achieved a cumulative installed capacity of 1,456 MW, equivalent to 115,987 panels.¹³⁷ The residential sector has implemented approximately 45% of this (666 MW). The remaining capacity is hosted by commercial buildings and utilities. Governor Green’s Executive Order No. 25-01, prioritized rooftop solar setting a target to solarize 10,000 rooftops annually until 2030. Additional support for these actions would include expanding the GEM\$ program and establishing a revolving fund where repayments are used to enroll new participants is needed.

This action will increase the number of solar PV systems installed in residential buildings by 7% annually, reaching a cumulative installed capacity of 3,256 MW by 2050. This is 78% of the total technical potential capacity in the Hawaiian Electric Service territory.¹³⁸

In the commercial sector, this action will reach a total capacity of 4,146 MW by 2050, which was calculated assuming that there is a proportional potential capacity installed in the utility service territories.

The maps below help to illustrate where rooftop solar can most directly support equitable outcomes by highlighting high-potential solar rooftops within the Honolulu urban area against Low-Income and Disadvantaged Communities (LIDACs). These communities are identified using a combined economic and social vulnerability framework detailed in Section 8. The map highlights locations where rooftop solar potential aligns with communities experiencing higher economic and social vulnerability. These areas represent priority opportunities for expanding residential and community solar programs and advancing energy-burden reduction goals. (See Figure 21)

¹³⁷ Hawaiian Electric Company. <https://www.hawaiianelectric.com/clean-energy-hawaii/our-clean-energy-portfolio/quarterly-installed-solar-data>

¹³⁸ Grue, Nick, Waechter, Katy, Williams, Travis, and Lockshin, Jane. 2020. *Assessment of Wind and Photovoltaic Technical Potential for the Hawaiian Electric Company*. Published by NREL. https://www.hawaiianelectric.com/documents/clean_energy_hawaii/integrated_grid_planning/stakeholder_engagement/stakeholder_council/20200818_sc_heco_tech_potential_final_report.pdf.

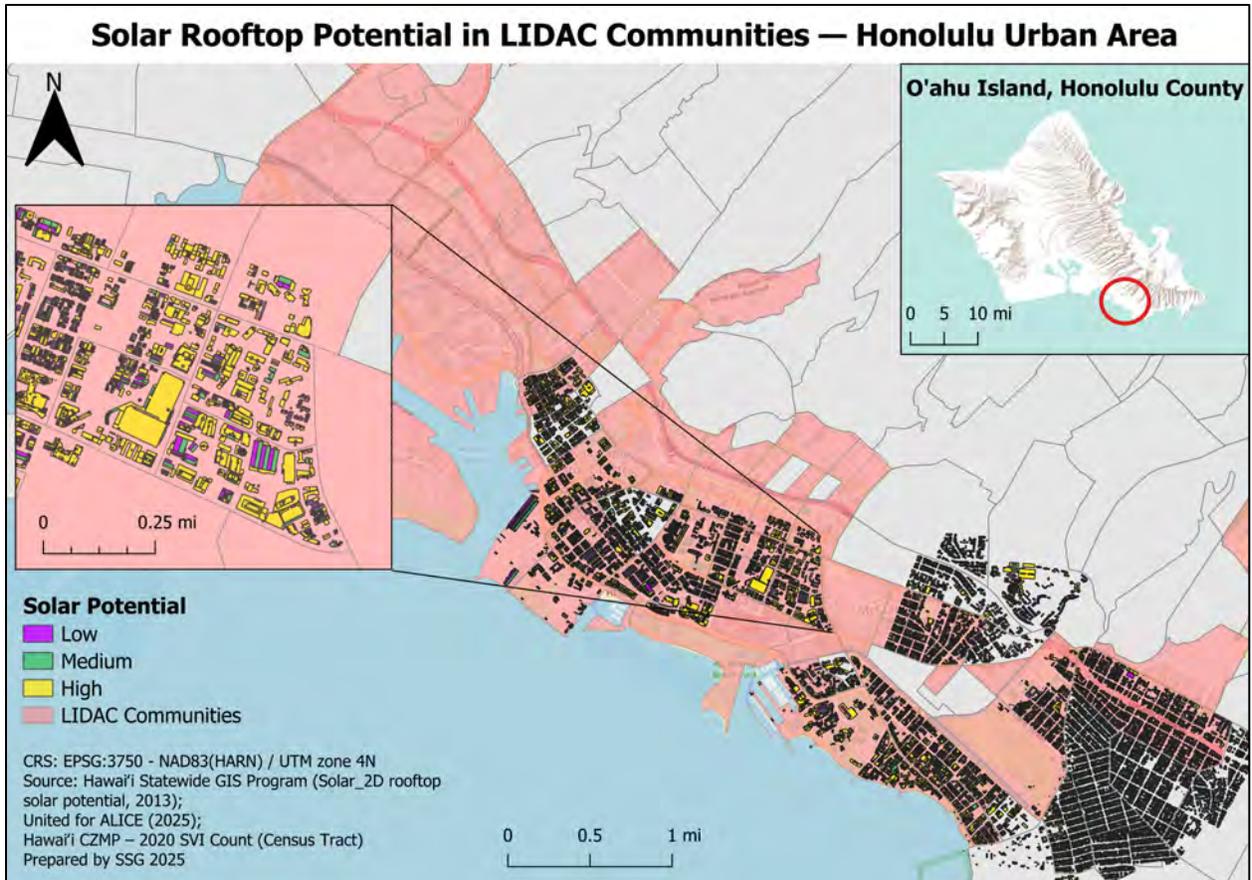


Figure 21: Potential rooftop solar areas within LIDAC communities in the Honolulu urban area. LIDAC identification methodology is provided in Section 8.

Measure: New Building Codes and Solar Water Heaters

This measure decreases energy consumption in new residential and commercial buildings by adopting more stringent energy building codes, particularly the 2024 International Energy Conservation Code (IECC) (to be adopted in new buildings in 2027-2028). Moving from the 2018 IECC to the 2024 IECC will decrease energy consumption 18% in new buildings. This measure also assumes that new residential buildings use solar water heaters or equivalent, reducing household energy consumption an average of 19%.

GHG Emissions Reductions in Buildings

The table below shows the projected baseline emissions of residential, commercial and military buildings.

MMT CO ₂ e	2026	2030	2035	2040	2045
Hawai'i	0.09	0.10	0.10	0.10	0.11
Honolulu	0.48	0.48	0.49	0.50	0.52
Kaua'i	0.03	0.04	0.04	0.04	0.04
Maui	0.09	0.09	0.10	0.10	0.10
Total	0.69	0.72	0.74	0.75	0.78

Table 19: Baseline Emissions from Residential, Commercial and Military Buildings in Milestone Years.

The following table illustrates emission reductions by modeled measure.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Reducing energy consumption in existing buildings	-0.10	-0.15	-0.18	-0.22	-0.26	-3.7
New building codes & solar water heaters	0	0	-0.0001	-0.00009	-0.00003	-0.0011
Distributed Solar PV	-0.12	-0.25	-0.42	-0.48	-0.48	-7.5
Total	-0.21	-0.40	-0.60	-0.70	-0.75	-11.2

Table 20: Emissions Reductions from Building Measures in Milestone Years.

Figure 22 shows emission trajectories between 2022 and 2050 for each measure in the buildings sector described above. Energy efficiency measures in existing buildings and installing distributed solar PV have the greatest emissions reduction effects.

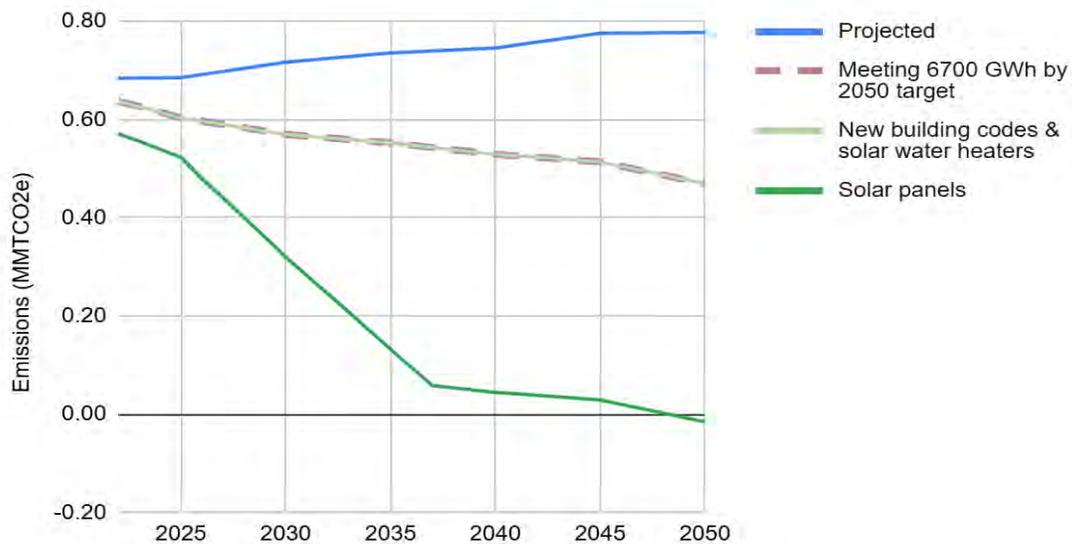


Figure 22: Impact of Efficiency Measures and Distributed Solar PV on Building Emissions.

Emission Reductions by County

Reduction in emissions by county from energy efficiency (EE) measures are shown in the figure below. Most of these reductions are on O‘ahu (77.5% by 2050), followed by Hawai‘i Island (10.4%), Maui (9.2%) and Kaua‘i (~3%). According to the projections of the Market Potential Study, O‘ahu will consume 68% of the total residential baseline energy consumption, and 70% of commercial building energy consumption.

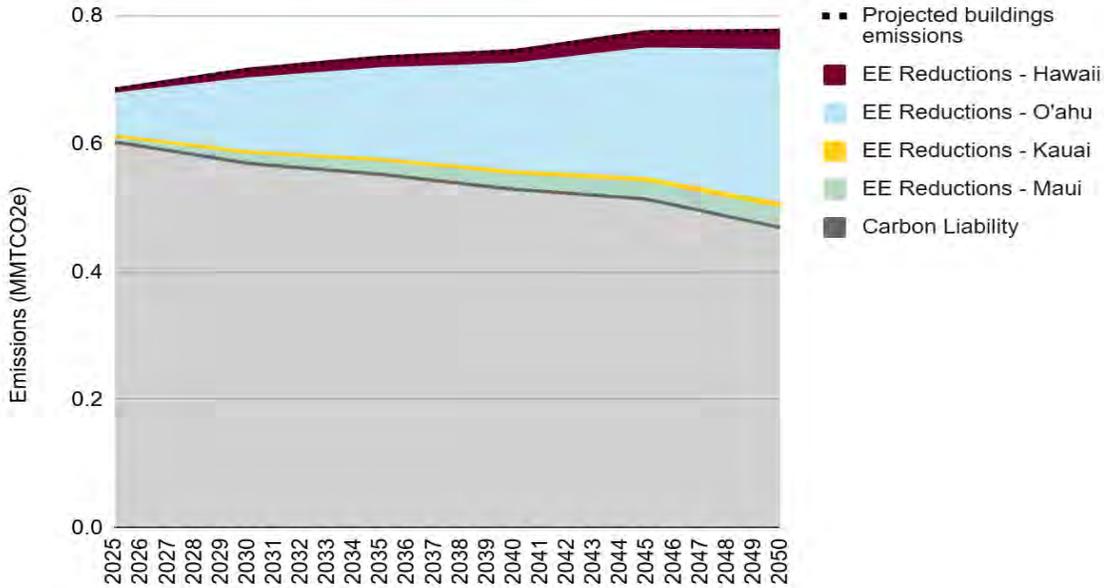


Figure 23: Projected Emission Reductions of Energy Efficiency (EE) Measures on Building Emissions by County.

Figure 24 shows the energy efficiency emission reductions aggregated together with emission reductions from installed PV capacity in residential and commercial buildings. This is also displayed by county. O‘ahu again has largest reductions with 66% of reductions by 2050 would take place in O‘ahu. Hawai‘i and Maui both have 15% reductions and Kaua‘i represents 3.5% of these reductions.

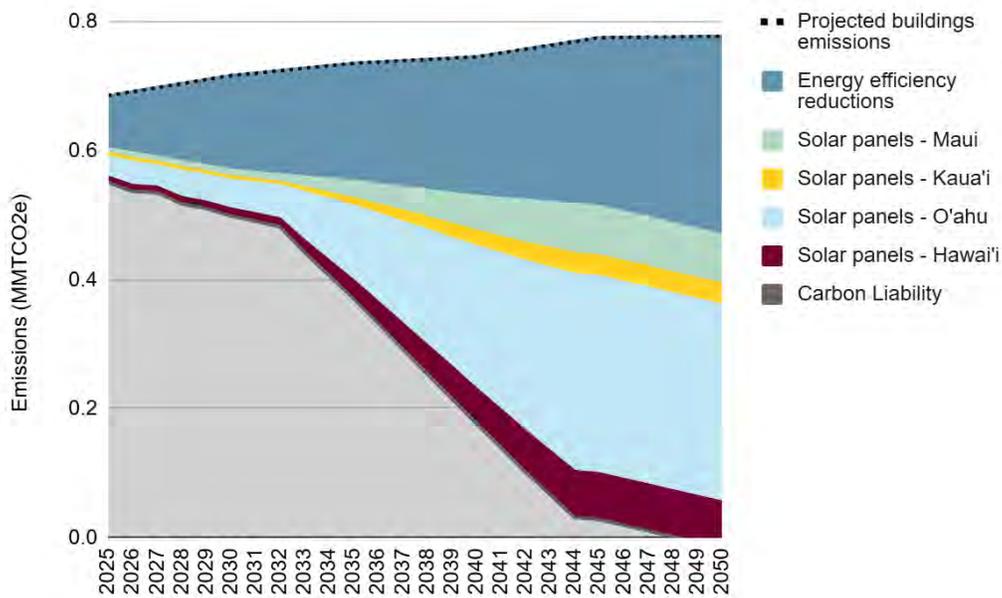


Figure 24: Projected Emission Reductions of Energy Efficiency Measures in Existing Buildings and Distributed Solar PV Measures by County.

From the beginning of the implementation period until 2032, emission reductions from energy efficiency measures in buildings represent more than 60% of the total reductions from building measures. This shifts in the 2030s, and Distributed Solar PV represent 61% of total reductions by 2050. Note that these reductions account only for energy consumed in buildings, not exported energy to the grid, to avoid double counting for grid decarbonization.

Emissions reductions from increased energy efficiency in new buildings were not represented in the figures above, since they are small by comparison. The table below shows emissions reductions attributable to new building codes.

County	Cumulative Reductions 2026-2045 (MMTCO ₂ e)
Hawai'i	-0.00016
Honolulu	-0.00083
Kaua'i	-0.00007
Maui	-0.00015
Total	-0.0011

Table 21: Cumulative Emissions Reductions from the New Building Codes Measure.

Co-Pollutant Reductions

The following three tables present the estimated co-pollutant reductions resulting from implementing low carbon measures in buildings: reducing energy consumption, implementing energy efficiency measures and renewables in new and existing buildings. In addition to reducing CO₂ emissions, decreasing energy consumption in buildings can deliver substantial air quality

improvements by reducing pollutants such as fine particulate matter (PM2.5) and its precursors: nitrogen oxides (NOx) and sulfur oxides (SOx).

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
SOx	-230.2	-242.0	-181.2	-192.6	-166.4	-3,827
NOx	-139.5	-146.7	-109.8	-116.7	-100.8	-2,320
PM2.5	-13.9	-14.7	-11.0	-11.7	-10.1	-232

Table 22: Co-pollutant reductions from reducing energy consumption in buildings.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
SOx	-51.9	-48.2	-127.2	-62.2	-34.6	-1,107
NOx	-31.5	-29.2	-77.1	-37.7	-21.0	-671
PM2.5	-3.1	-2.9	-7.7	-3.8	-2.1	-67.1

Table 23: Co-pollutant reductions from energy efficiency measures in new buildings (new building energy codes and solar water heaters).

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
SOx	-1,576	-1,376	-1,500	0	0	-15,764
NOx	-955	-834	-909	0	0	-9,554
PM2.5	-95	-83	-91	0	0	-955

Table 24: Co-pollutant reductions from implementing distributed solar PV in buildings.

These figures highlight the broader public health and environmental co-benefits of more efficient and cleaner energy.

Further Resilience Measures

In addition to the mitigation-focused measures in this chapter, Hawai‘i must strengthen buildings, homes, infrastructure, and neighborhoods to withstand the climate hazards already accelerating across the islands. More intense storms, stronger winds, heavier downpours, and inland–coastal flooding are placing older homes, drainage systems, and lifeline infrastructure under increasing strain. Rising temperatures and expanding wildfire risk further expose vulnerable neighborhoods and critical facilities. Sea-level rise is elevating groundwater tables, increasing saltwater intrusion, and contributing to more frequent flooding in low-lying structures and utility corridors. The resilience measures that follow respond directly to these growing risks by hardening homes, improving climate-smart design in new development, and ensuring critical systems and transportation routes remain operational during extreme events.

Homes and Buildings

Provide funding, technical assistance, and outreach for upgrading older homes to modern wind standards (hurricane clips and straps, continuous load paths, roof-deck nailing, gable bracing, and impact-rated shutters). Pair these upgrades with basic weatherization, attic ventilation, cool roofs, and wildfire hardening (fire-resistant vents, windows, and ember-proofing). Prioritize low- and moderate-income households and neighborhoods with high wind, wildfire, and flood risk. Require new homes in fire-, flood-, and wind-prone areas to meet entry-level wildfire- and wind-resistant construction standards aligned with the IBHS “Wildfire Prepared Home – Base” designation.

COST: \$260 million for a 5-year pilot program for such actions would require approximately \$52 million per year to retrofit 8,000 homes. This investment should prioritize LIDAC households in high-risk wind, wildfire, and flood zones.¹³⁹

Neighborhoods

Identify measurable targets such as percent tree cover, minimum spacing and orientation for breezeways, percent of permeable surfaces and other metrics to strengthen design-review for new projects.

Green-street retrofits such as rain gardens, bioswales, and permeable surfaces to slow, spread, and sink stormwater, prioritized first in neighborhoods with recurrent nuisance flooding and combined inland and coastal risk.

Use high solar reflectance building materials and colors for windows, pavements, and coatings.

Infrastructure

Use updated critical-systems assessments to prioritize hardening of power, water, wastewater, telecom, and port/airport facilities. Establish minimum continuity standards so clinics, shelters, pump stations, and emergency centers remain operational during extended outages.

Elevate or flood-proof electrical rooms, communication hubs, pump stations, and other critical equipment. Install backflow preventers in flood-prone areas and design systems to operate under high tailwater conditions caused by sea-level rise.

Bury electric distribution lines and communication infrastructure where sea-level rise exposure is low to reduce outages from storms, falling trees, and wind. Undergrounding also lowers wildfire ignition risk in grass-dominated areas and should be prioritized for high fire-risk areas. Co-locating utilities in shared corridors speeds repairs and future upgrades.

Plan for relocation or elevation of shoreline roads and bridges where long-term protection is not feasible. Ensure redundancy for communities with single-access evacuation routes.

¹³⁹ Hawai‘i Climate Advisory Team (2025, January).

8.7 Key Implementing Agencies

The Hawai‘i Public Utilities Commission (PUC) evaluates the State’s EEPS progress every five years, beginning in 2013, and may revise the standard based on the best information available at the time to determine if the existing standard remains effective and achievable. The Commission reports its findings and revisions regarding the EEPS, to the legislature every five years.

Hawai‘i State Energy Office (HSEO) §HRS 196-71 outlines HSEO’s jurisdiction in taking the lead for the measures proposed in this sector. §HRS 196-72 enables the Chief Energy officer of the HSEO to “[d]evelop and recommend programs for, and assist public agencies in the implementation of, energy assurance and energy resilience”. Act 239 (SLH 2022), Chapter 196, Hawai‘i Revised Statutes, added two new sections which requires all state facilities to implement cost-effective energy efficiency measures. Additionally, whenever new building codes or standards are adopted, all new state building construction must comply with the updated Hawai‘i state building codes within one year, ensuring that public buildings are designed and built to the most current energy and safety standards.

Hawai‘i Green Infrastructure Authority (HGIA) was established by HRS §196-63. HRS §196-64. authorizes HGIA to administer a green infrastructure loan program by providing loans and funding for the purchase or installation of equipment that support clean energy, demand response, and energy efficiency technologies. It also empowers HGIA to contract consultants for expert advice and support, and manage all necessary administrative aspects of the program allowing contracts to proceed without the usual procurement process requirements under standard state law.

Hawai‘i Department of Hawaiian Home Lands (DHHL) designs and develops homestead subdivisions, and can integrate energy-efficient building standards, solar-ready design, EV-charging readiness, and efficient community infrastructure. Policies like requiring or encouraging Energy Star appliances, solar water heaters, and better insulation reduce long-term utility costs for beneficiaries. DHHL also leases parcels to renewable developers for utility-scale and community-based renewable energy (CBRE) projects.

County Planning Authorities are responsible for building permits for rooftop PV, solar water heating systems, EV chargers, and energy-efficiency upgrades, enforces and administers the County Building Codes, Electrical Code, Plumbing Code, Fire Code (joint enforcement), and related ordinances. County planning authorities play an important role in streamlining energy transition. Authorities include City and County of Honolulu’s Department of Planning and Permitting (DPP) and relevant divisions (Building Division, Mechanical/Electrical Review, Site Development Division), Hawai‘i County Planning Department, Hawai‘i County Department of Public Works, Building Division, Maui County Department of Planning, and Kaua‘i County Planning Department.

County Energy Efficiency Programs: City and County of Honolulu’s Office of Climate Change, Sustainability & Resiliency (OCCSR) coordinates with DPP to integrate energy-efficiency standards into future building code updates. County of Maui, Department of Environmental Management, Environmental Protection and Sustainability Division develops and administers county-wide energy-efficiency, renewable energy, and resilience programs, works on policies

related to building electrification, efficiency, benchmarking, and emissions reduction and supports rebuilding and resilient code discussions post-wildfires. County of Hawai‘i Office of Sustainability, Climate Action, and Resilience oversees energy efficiency programs, sustainability planning, and building efficiency programs for county facilities, and community programs. County of Kaua‘i’s Office of Sustainability and Resilience supports county-level energy-efficiency, clean energy, energy efficiency and green building initiatives.

Hawai‘i Energy is currently the State’s third-party administrator for Hawaiian Electric, serving customers on the islands of Hawaii, Maui, Molokai, Lanai, and Oahu. Hawai‘i Energy educates island families and businesses about the many, lasting benefits of clean energy. They provide information on rebates that can save money, grow the economy and reduce energy demand.

8.8 Implementation Schedule, Milestones and Metrics for Tracking Progress

BUILDINGS ENERGY EFFICIENCY		
Action	Schedule	Metrics
4. Distributed Solar PV	Increase capacity of PV systems in residential buildings: - 2026-2030: 10,000 units per year. - 2030-2045: Increase rate of 7% per year, equivalent to an average of 18,500 units per year. Increase capacity of PV systems in non-residential buildings: 2026: Plan installations and establish PV panel sources. By 2050: reach a capacity of 4,146 MW.	Number and capacity (MW) of PV systems installed per year at residential and commercial buildings.
5. REDUCE ENERGY CONSUMPTION IN BUILDINGS	Reduce forecasted baseline energy consumption (GWh): - 46.4% by 2040 - 60% by 2050 2026: Create a building retrofit incentive program. 2027: Target 1% of Hawai‘i homes for retrofit. 2028-2035: Increase target by 2% of remaining homes to retrofit each year. 2036-2045: Increase retrofit target by 3% annually. 2046-2045: Increase target by 5% annually.	Gigawatt-hours cumulative persisting energy efficiency savings in buildings. Track energy consumption per building.
6. NEW BUILDING CODES & SOLAR WATER HEATERS	By 2028 adopt the 2024 IECC building codes. By 2030 new residential buildings use solar water heaters.	- Update of policies for buildings. - New building units with solar water heaters.

Table 25: Buildings Sector Measures Implementation Schedule and Milestones.

8.9 Cost Estimates for Implementation

Reducing energy consumption in buildings costs \$12 billion and saves \$23 billion, bringing net implementation savings of over \$12 billion. Costs of implementing the action considers an average cost of retrofitting per residential unit of \$18,225. This cost was calculated using the affordable green housing action from the PCAP and it is quite a conservative estimation. Savings were calculated residential electricity rates (\$/kWh) reported by Hawaiian Electric¹⁴⁰ and KIUC¹⁴¹ for 2024, which is projected using a 3.2% consumer price index (CPI) until 2026 and then it is held constant up to 2045. In the case of commercial buildings, costs of envelope retrofits per square feet¹⁴² were considered. The net present value of costs amounts to \$12 billion while savings are \$23 billion, leaving a net present value of revenues for the action.

New building codes involve net savings of \$6 million, while implementing distributed solar PV would require \$4 billion in costs and would bring more than \$3 billion in savings, leading to \$877 million of net costs for implementing the action. This is probably because most of the savings of the panels' lifetime occur after the evaluation period (2026 – 2045).

Action	Costs (\$M)	Savings (\$M)	NPV (\$M)
Reduce energy consumption in buildings	\$12,115	\$23,244	\$ (11,129)
New building codes	-	\$6	\$ (6)
Distributed Solar PV	\$4,319	\$3,262	\$ 877
Total	\$16,253	\$26,511	\$(10,258)

Table 26: Buildings Sector Measures Net Costs and Savings.

Energy efficiency measures generate net savings in every sector and county. The table below shows the net present value of costs and saving for each county and each type of building: residential, commercial and military. Hawai‘i and Maui have a higher saving versus cost rate. This is mainly due to the fact that electricity rates in these counties are higher. Costs and savings for military buildings are lower in comparison to the residential and commercial sectors because there are less of them. Moreover, most of the military buildings stock is concentrated in Honolulu, so within these buildings, this is the county with most costs and savings.

¹⁴⁰ Hawaiian Electric Company <https://www.hawaiielectric.com/billing-and-payment/rates-and-regulations/average-price-of-electricity>

¹⁴¹ Kaua‘i Island Utility Cooperative <https://kiuc.coop/rates>

¹⁴² Pembina Institute. (2016, November) Building Energy Retrofit Potential in B.C. <https://www.pembina.org/docs/event/netzeroforum-backgrounder-2016.pdf>

Building Type	County	Costs (\$M)	Savings (\$M)
Residential	Hawaii	\$861	\$1,712
	Honolulu	\$3,267	\$5,766
	Kaua‘i	\$311	\$519
	Maui	\$705	\$1,398
Commercial	Hawaii	\$682	\$1,482
	Honolulu	\$4,022	\$7,748
	Kaua‘i	\$297	\$541
	Maui	\$729	\$1,578
Military	Hawaii	\$1	\$3
	Honolulu	\$1,234	\$2,489
	Kaua‘i	\$3	\$6
	Maui	\$1	\$2

Table 27: Net Costs and Savings of Energy Efficiency Measures in Buildings.

Reducing energy consumption in residential buildings also reduces household electricity bill burden (the percentage of household income spent on energy). Table 28 displays the average annual incomes and energy bill costs by county and income category. With these incomes and energy bill costs, electricity bill burden for households in 2022 was calculated. The table also shows the energy savings that would be experienced under CAP building energy efficiency measures. The last column shows the expected percentage of the population continuing to suffer from electricity bill burdens after building energy efficiency measures are taken. The CAP measures decrease electricity bill burdens by as much as a factor of four.

County	Income	Annual income (\$)	Annual Energy Cost (\$)	Electricity Burden (2022)	CAP Annual Savings (\$)	CAP Electricity Burden
Hawai‘i	Low Income	\$28,114	\$2,365	8.4%	\$1,905	1.60%
	Above LI	\$144,306	\$2,579	1.8%	\$1,880	0.50%
Honolulu	Low Income	\$27,097	\$2,383	8.8%	\$1,689	2.60%
	Above LI	\$154,082	\$2,686	1.7%	\$1,672	0.70%
Kaua‘i	Low Income	\$28,114	\$2,365	8.4%	\$1,611	2.70%
	Above LI	\$144,306	\$2,579	1.8%	\$1,563	0.70%
Maui	Low Income	\$28,630	\$2,528	8.8%	\$1,910	2.20%
	Above LI	\$153,399	\$2,828	1.8%	\$1,867	0.60%

Table 28: Savings by income category

Financial results for the distributed solar PV measure are shown in the table below. distributed solar PV has a net cost during the evaluation period (2026-2045), however there is a net savings past this period.

Sector	County	Costs (M\$)	Savings (M\$)
Residential	Hawai‘i	\$302	\$224
	Honolulu	\$1,147	\$851
	Kaua‘i	\$109	\$81
	Maui	\$247	\$184
	Total	\$1,805	\$1,340
Commercial	Hawaii	\$278	\$229
	Honolulu	\$1,637	\$1,349
	Kaua‘i	\$121	\$100
	Maui	\$297	\$244
	Total	\$2,333	\$1,922

Table 29: On-site distributed solar PV Net Costs and Savings during the 2026-2045 period.

8.10 Funding Sources

Federal support for building and energy efficiency has not only decreased, but there has also been a complete reversal previous Executive Orders, standards, and guidelines. The “Unleashing American Energy” EO mandates consumer choice for various appliances by suspending, revising or rescinding energy efficiency rules for appliances such as lightbulbs, washing machines, and water heaters. In November 2025, the DOE formally removed support for the “Zero Emissions Building” Guidance. These changes have led to a significant decline in public funding, suspending opportunities for families to save thousands in energy costs, however, some companies and private sector organization still support building and energy efficiency allowing consumers to continue to save money.

Federal Funds

The U.S. Department of Energy has several programs to support distributed solar and energy efficiency programs. The Buildings Upgrade Prize (Buildings UP) from the U.S. Department of Energy offers more than \$22 million in cash prizes and technical assistance to teams that propose innovative ways to retrofit existing buildings for energy efficiency and clean-energy readiness. Winning teams under the “Equity-Centered Innovation” Pathway receive \$400,000 in cash, while “Open Innovation” winners receive \$200,000, and all recipients get technical support to help implement upgrades such as heat pumps, improved insulation, and efficient electrification.¹⁴³ The Energy Efficiency Revolving Loan Fund Capitalization Grant Program provides formula-based grants to states to establish revolving loan funds that finance energy-efficiency audits, upgrades,

¹⁴³ U.S. Department of Energy Buildings Upgrade Prize <https://www.energy.gov/eere/buildings/buildings-upgrade-prize-buildings>

and retrofits for commercial and residential buildings. Overall funding available through the program was set at \$250 million (national allocation), with individual supplemental capitalization grants to eligible states capped at \$15 million.¹⁴⁴

State Funds

The Hawai‘i Office of Community Services Weatherization Assistance Program (WAP) provides eligible low-income households with weatherization upgrades, such as efficient lighting, heat-pump or solar water heaters, and other energy-saving measures, at no cost, with funding covering up to approximately \$3,000–\$5,000 per household for these energy-efficiency improvements.¹⁴⁵ The Hawai‘i Energy Appliance Rebates program offers cash-back incentives to help residents upgrade to energy-efficient household appliances, for example, a \$250 rebate for trading in an old refrigerator, a \$700 instant rebate for ENERGY STAR heat-pump water heaters, and other rebates for efficient washers, dryers, and lighting.¹⁴⁶

The Hawaii Green Infrastructure Authority (HGIA) “GEM\$ On-Bill Program” lets eligible homeowners, renters, small businesses, nonprofits, and multi-family landlords finance clean-energy upgrades (like solar PV, solar water heaters, or heat-pump water heaters) with no upfront cost. Repayments are spread over long terms (up to 20–25 years) at a below-market fixed interest rate, and the monthly payment is simply added to the household’s regular utility bill, making modern clean-energy and efficiency upgrades accessible to low- and moderate-income residents and underserved ratepayers.¹⁴⁷

The Hawai‘i State Energy Office offers rebates of up to \$2,000 for solar water heaters, \$700 for heat-pump water heaters, and additional incentives for efficient appliances, lighting, and cooling systems to help residents and businesses adopt energy-efficient and clean-energy technologies.¹⁴⁸ The Hawai‘i Energy EmPOWER Grant provides grants of up to \$9,000 (on Maui, Hawai‘i Island, etc.) or up to \$6,000 (on O‘ahu) to eligible nonprofits, small businesses, and restaurants for energy-efficiency upgrades.¹⁴⁹

¹⁴⁴ Formula Funding through the Energy Efficiency Revolving Loan Fund Capitalization Grant Program <https://www.energy.gov/articles/biden-harris-administration-announces-250-million-finance-energy-efficiency-upgrades>

¹⁴⁵ State of Hawai‘i Office of Community Services Weatherization Assistance Program, <https://labor.Hawai‘i.gov/ocs/service-programs-index/weatherization-assistance-program/>

¹⁴⁶ Hawai‘i Energy Appliance Rebates, https://Hawai‘ienergy.com/for-homes/rebates/appliances/?gad_source=1&gad_campaignid=20586843332&gbraid=0AAAAABxB0iaEsRLg1NxcH-JiJ5TIImuF3f&gclid=EAiaIQobChMIg_T1pY2nkQMVir5ECB3jsAtDEAAAYASAAEgJkJPD_BwE#fridge-tradeup?utm_source=moto&utm_medium=sem&utm_campaign=fridge

¹⁴⁷ Hawai‘i Green Infrastructure Authority GEM\$ On-Bill Program, <https://gems.Hawai‘i.gov/gems-on-bill/>

¹⁴⁸ Hawai‘i State Energy Office Tax Initiatives, [https://energy.Hawai‘i.gov/income-guidelines-and-tax-resources/#:~:text=\(state\)%20RENEWABLE%20ENERGY%20TECHNOLOGIES%20INCOME%20TAX%20CR&EDIT%20\(RETITC\)&text=If%20the%20credit%20earned%20exceeds%20the%20total,certain%20conditions%20the%20credit%20may%20be%20refundable.](https://energy.Hawai‘i.gov/income-guidelines-and-tax-resources/#:~:text=(state)%20RENEWABLE%20ENERGY%20TECHNOLOGIES%20INCOME%20TAX%20CR&EDIT%20(RETITC)&text=If%20the%20credit%20earned%20exceeds%20the%20total,certain%20conditions%20the%20credit%20may%20be%20refundable.)

¹⁴⁹ Hawai‘i Energy Empower Grant, <https://Hawai‘ienergy.com/for-business/empower-grant/>

County Funds

The County of Hawai‘i R&D Homeowners Tax¹⁵⁰ offer homeowners Inflation Reduction Act funded rebates (part of the state’s \$34.3 million allocation) providing up to \$7,500 per household to offset energy-efficient upgrades and generate long-term savings on utility bills.¹⁵¹

The County of Maui Sustainability Grant Program supports energy-efficiency, renewable energy, and sustainable building initiatives through several grant streams. In FY 2026 it offers up to \$100,000 for “Green Building & Resilient Housing” grants and \$100,000 for “Renewable Energy” grants to fund clean-energy installations, energy-efficient upgrades, and resilient building or housing projects.¹⁵²

Kaua‘i Island Utility Cooperatives Appliance Replacement Rebate program gives residential customers rebates of \$100 for replacing older refrigerators, freezers, clothes washers, or dryers with more efficient models. They also offer rebates of \$250–\$350 for qualifying high-efficiency ductless split air-conditioners under their Efficient A/C Replacement Program.¹⁵³

Public-Private & Philanthropic Partnerships

The Hawaii Green Infrastructure Authority (HGIA)’s HI C-PACER program enables building owners, condominium associations, and property developers to finance energy efficiency, clean energy, water-conservation, and resiliency upgrades for commercial, multifamily, or agricultural properties with financing available for up to 100% of project costs.¹⁵⁴

The Daniel K. Thorne Foundation: This foundation supports the preservation of natural and built environments including grants to organizations working on environmental conservation, habitat protection, and heritage or built-environment preservation, including sustainable building or energy-efficiency initiatives. In recent years the foundation’s grants have ranged from approximately \$5,000 (median) up to around \$154,000 per grant, with a typical grant around of \$7,500.¹⁵⁵

¹⁵¹ County of Hawai‘i R&D Homeowners Tax Credits and Rebates. accessed December 5, 2025, <https://www.rd.Hawai‘i-county.gov/economic-development/climate-change-action/inflation-reduction-act-ira-resources/homeowners>

¹⁵² County of Maui Sustainability Grant Program, accessed December 5, 2025, <https://www.mauicounty.gov/2725/Sustainability-Grants>

¹⁵³ Kaua‘i Island Utility Cooperatives, accessed December 5, 2025, <https://kiuc.coop/appliance-programs>

¹⁵⁴ Hawai‘i Green Infrastructure Authority HI C-PACER , accessed December 5, 2025, <https://gems.Hawai‘i.gov/hi-c-pacer/>

¹⁵⁵ The Daniel K. Thorne Foundation Grant, accessed December 5, 2025, <https://www.thorne.org/>



9. Transportation: Ground, Air & Marine

MEASURES

9. VEHICLES ELECTRIFICATION

10. GROUND TRANSPORTATION FUEL DE-CARBONIZATION

11. MODE SHIFT

12. AIR TRANSPORTATION FUEL DE-CARBONIZATION

13. REDUCE FUEL CONSUMPTION IN AIR TRANSPORTATION

14. AIRCRAFT ELECTRIFICATION

15. MARINE TRANSPORTATION FUEL DE-CARBONIZATION

16. ENERGY EFFICIENCY IN CRUISE SHIPS

9. Transportation: Ground, Air & Marine

9.1 Overview

The transportation sector is a significant contributor to greenhouse gas (GHG) emissions in Hawai‘i and its decarbonization is paramount to achieving the state's ambitious climate goals. The State of Hawai‘i Department of Transportation (HDOT) has developed a comprehensive “Energy Security and Waste Reduction Plan” for 2025-2029, which outlines strategies for the reduction and eventual elimination of all transportation-related GHG emissions. This Plan is a direct response to the requirements of the Navahine Settlement Agreement and various state statutes, including Hawai‘i Revised Statutes (HRS) § 225P-5, which establishes the 2030 and 2045 statewide emissions reduction targets.¹⁵⁶ HRS § 225P-7 mandates the decarbonization of the transportation sector and state agency fleets, while HRS § 225P-8 sets a statewide goal of zero emissions across all transportation modes: ground, sea, and air interisland transportation.¹⁵⁷

The Plan systematically details strategies organized by mode, Aviation, Marine, and Ground transportation, and identifies opportunities to increase carbon removals as a crucial supplement to emission reductions. Hawai‘i must make substantial investments in carbon removals and sequestration between 2025 and 2030 to offset anticipated residual GHG emissions and achieve its 2045 net-negative emissions target.¹⁵⁸

Decarbonizing Hawai‘i's transportation sector is a monumental task that necessitates active collaboration and participation from all stakeholders, including significant legislative actions to enable the implementation of proposed strategies. Addressing all relevant GHG emission sources, regardless of size, is critical for achieving comprehensive decarbonization. The Plan acknowledges that some sources, such as long-haul aircraft, inter-state and intra-state marine vessels, and legacy internal combustion engine (ICE) vehicles, will be more challenging to decarbonize and may require longer periods for full transition. This foundational work will be further refined through Annual Action Plans that provide updates and adjustments on specific actions, actors, and timelines as more data and insights become available.¹⁵⁹

The core of the HDOT Plan emphasizes a multi-pronged approach, recognizing that no single strategy can achieve the ambitious goals. Key actions include:

¹⁵⁶ The Navahine Settlement Agreement reached in 2024 acknowledges the constitutional rights of Hawai‘i's youth to a life-sustaining climate and confirms the commitment by HDOT to plan and implement transformative changes of Hawai‘i's transportation system to achieve the state's goal of net-negative emissions by 2045. See <https://governor.hawaii.gov/newsroom/office-of-the-governor-news-release-historic-agreement-settles-navahine-climate-litigation/>

¹⁵⁷ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan: A Plan to Increase Hawai‘i's Energy Security and Access Options, and Reduce Inefficiencies in Transportation 2025-2029*. Executive Summary, pp. 2-4.

¹⁵⁸ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

¹⁵⁹ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

- **Scaling up Electric Vehicles (EVs) and Charging Infrastructure:** Expanding public charging networks, converting transit vehicles to electric, and offering financial incentives for EV adoption.
- **Transitioning Aviation and Marine to Cleaner Fuels:** Promoting sustainable aviation fuel (SAF), bio-/renewable-diesel, and renewable liquid natural gas (LNG), with long-term plans for alternative clean fuels like green hydrogen.
- **Modernizing Ports and Airports:** Implementing energy efficiency measures and supporting the electrification of ground support equipment.
- **Promoting Low-Carbon Alternatives:** Expanding public transit, improving bicycle and pedestrian infrastructure, and encouraging ridesharing and compact development.
- **Engaging Stakeholders:** Collaborating with the HDOT Youth Council and other external partners to ensure broad support and effective implementation.¹⁶⁰

A critical cross-cutting theme is electrification, which requires grid modernization and a successful transition to renewable energy sources by the energy sector, as outlined in the Hawai‘i Statewide Decarbonization Plan and mandated by HRS § 269-92. The Plan views decarbonization not just as a means to reduce harm but as an opportunity for Hawai‘i to partner, innovate, and invest in building a more efficient transportation system that enhances mobility, energy security, and economic activity for future generations.¹⁶¹

Priority actions are identified based on their potential for significant emission reductions or their ability to quickly make a meaningful difference. For aviation, these include creating a market and regulatory framework for Sustainable Aviation Fuel (SAF), deploying electrification strategies for airfield and ground access, adopting ramp efficiency optimization, and supporting inter-island aviation electrification. For marine transport, priorities involve policies to reduce cruise ship calls, market-based mechanisms for clean marine fuels, and developing infrastructure for bio-renewable-diesel and renewable Liquid Natural Gas (LNG). Ground transportation decarbonization actions, particularly those that reduce vehicle miles traveled, also improve health, environmental, and economic outcomes for everyone. Vehicle dependency, congestion, collisions, and emissions burden communities with social, health, economic, and personal costs. On average, over 100 people per year are killed in collisions on Hawai‘i’s roads and highways.¹⁶² Hawai‘i has a \$27.4 billion annual burden from ground transportation costs that burden lower-income households disproportionately from increased used car costs, higher interest rates, and greater exposure to pollution and road-related injuries.¹⁶³ Key actions include expanding transportation choices (transit, bicycle, pedestrian), increasing EV use through charging infrastructure expansion and financial incentives, and promoting low-carbon fuels for hard-to-electrify vehicles. Administrative

¹⁶⁰ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

¹⁶¹ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

¹⁶² State of Hawai‘i Department of Business, Economic Development, and Tourism (DBEDT). 2022a. “Major Traffic Accidents, Traffic Injuries, and Traffic Deaths, 2002 to 2021, and by County, 2020 and 2021.” No. 18.20. In *The State of Hawai‘i Data Book*. Honolulu: State of Hawai‘i Department of Business, Economic Development, and Tourism, 2022. <https://files.hawaii.gov/dbedt/economic/databook/db2022/section18.pdf>

¹⁶³ Ulupono Initiative. (2025) *The Cost of the Vehicle Economy* https://ulupono.com/media/rddfxc20/the-cost-of-the-vehicle-economy-in-hawaii_2025-7-14-final.pdf

actions include workforce awareness, a Green Procurement Program, and energy efficiency in office spaces.¹⁶⁴

Overall, alternative fuels for aviation, primarily SAF, represent the largest share of projected emission reductions. Vehicle and equipment electrification across aviation and ground transport follows as the next largest contributor. Fuel and energy reduction measures, such as optimizing aircraft movements, expanding multimodal transport, demand management to reduce VMT, and limiting cruise ship trips, also play a significant role.¹⁶⁵

Hawai‘i has identified 274 climate-focused transportation projects totaling \$1.98 billion, demonstrating strong statewide readiness to implement clean mobility solutions. These projects span all counties and include multimodal networks, transit and intersection upgrades, expanded sidewalks, safety enhancements, EV charging infrastructure, and Safe Routes to School improvements, with most led by the Department of Transportation and scoped for rapid deployment once funded. Readiness also extends to innovative marine and aviation efforts, including the electric Seaglider Initiative and ongoing Hawai‘i State Energy Office (HSEO) studies on aviation decarbonization.^{166, 167} These projects show Hawai‘i’s readiness to tackle the challenges of transportation decarbonization.

9.2 Key Features

Hawai‘i’s unique geography as an isolated island chain profoundly shapes its transportation sector. This isolation necessitates a heavy reliance on air and marine transport for connectivity, commerce, and tourism, in addition to extensive ground transportation networks within each island. Hawai‘i’s transportation system is fundamentally intermodal, comprising:

- **Ground Transportation:** This includes personal vehicles, public transit (buses, and now Honolulu’s rail system), bicycles, and pedestrian networks. Light-duty passenger vehicles constitute the majority of ground transportation emissions.¹⁶⁸ Efforts are underway to expand electric vehicle (EV) adoption, charging infrastructure, and promote modes like walking, cycling, and public transit. Hawai‘i also has a healthy visitor industry with visitors driving an estimated 2,092,000 miles each day
- **Aviation:** This sector is vital for inter-island travel, domestic connections to the U.S. mainland, and international tourism. Major airports on each island handle significant passenger and cargo volumes. Aviation emissions are primarily from the combustion of jet fuels.¹⁶⁹

¹⁶⁴ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*

¹⁶⁵ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

¹⁶⁶ Hawai‘i Sea glider Initiative, accessed Dec 6, 2025, <https://www.hawaiiseaglider.org/>

¹⁶⁷ Hawaii State Energy Office, Decarbonization, accessed December 6, 2025 [https://energy.hawaii.gov/clean-energy-vision/decarbonization-](https://energy.hawaii.gov/clean-energy-vision/decarbonization-strategy/#:~:text=EVALUATING%20Decarbonization,needs%20of%20a%20decarbonized%20economy;)

[strategy/#:~:text=EVALUATING%20Decarbonization,needs%20of%20a%20decarbonized%20economy;](https://energy.hawaii.gov/clean-energy-vision/decarbonization-strategy/#:~:text=EVALUATING%20Decarbonization,needs%20of%20a%20decarbonized%20economy;)

¹⁶⁸ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*. Section 2: Greenhouse Gas Emissions Inventory and Forecast, pp. 23-32.

¹⁶⁹ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*

- **Marine Transportation:** This covers inter-island cargo shipping, domestic and international shipping (including cruise lines), and commercial harbor craft. Marine transport is critical for goods movement and tourism.¹⁷⁰

Energy Dependence

Hawai‘i is heavily dependent on imported fossil fuels for its energy needs, including transportation. This dependence poses significant energy security risks and contributes to GHG emissions. HRS § 226-18 defines State policy to develop dependable, efficient, and economical energy systems, increase energy security and self-sufficiency through reduction and ultimate elimination of Hawai‘i’s dependence on imported fuels for electrical generation and ground transportation.¹⁷¹ This overarching energy transition is foundational to decarbonizing the transport sector, as electrification strategies rely on a clean grid.¹⁷²

Existing Infrastructure and Future Development

Hawai‘i possesses a comprehensive network of highways, bridges, tunnels, airports, and harbors. However, much of this infrastructure was designed for a fossil-fuel-dependent economy. Future development focuses on modernizing these assets to support decarbonization, including:

- **Electrification Infrastructure:** Expanding public and private EV charging networks, electrifying airport ground support equipment (eGSE), and exploring electric inter-island aircraft and marine vessels.
- **Sustainable Fuel Production:** Developing capabilities for local production and import of sustainable aviation fuels (SAF), renewable diesel, and green hydrogen.
- **Multimodal Integration:** Improving public transit, bicycle, and pedestrian networks to reduce reliance on single-occupancy vehicles. Honolulu’s Skyline rail project is a key example of an ongoing effort to reduce road congestion and emissions. As one community member expressed "If we focus more on making public transportation accessible, affordable, and efficient, we would solve many of our traffic issues including traffic-related deaths, pollution, overcrowded roads, noise pollution...The city would just look and feel better in general."

Policy Environment: Hawai‘i’s legislature has paved the way for actions through legislative measures that aim to achieve zero-emissions transportation, support technological advances, and create a connected network for vehicles, with a priority for public transit, bicycles, and pedestrians to ensure safe and accessible routes for all. These policies create a robust framework for HDOT's initiatives, guiding investment, infrastructure development, and stakeholder collaboration.

Regulatory Authority: Regulation of transportation emissions is a multi-jurisdictional landscape of federal, state and county laws and agencies. Certain federal regulations limit the State’s ability to regulate GHG emissions. Under federal law states are prohibited from setting independent standards for gasoline formulation, aviation fuels, marine bunker fuel, fuel carbon intensity standards. This comes from the federal Energy Policy and Conservation Act (EPCA), Clean Air

¹⁷⁰ Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*.

¹⁷¹ [Hawaii Revised Statutes § 226-18 \(2024\) - Objectives and policies for facility systems--energy. :: 2024 Hawaii Revised Statutes :: U.S. Codes and Statutes :: U.S. Law :: Justia](#)

¹⁷² Hawai‘i Department of Transportation. (2025). *Energy Security and Waste Reduction Plan*

Act fuel programs, Federal Aviation Act, International maritime agreements (IMO, MARPOL). Despite these limits, Hawai‘i control in-state emissions from buildings, power plants, land use, and state and local transportation planning including electric utilities, building codes & energy efficiency, land use & transportation planning, state fleet electrification requirements, GHG reporting from large stationary sources (HAR 11-60.1) and statewide climate goals (Act15, Act 238). So Hawai‘i can control in-state emissions from buildings, power plants, land use, and state/local transportation planning but not federal sectors (aviation, shipping) or federally-regulated vehicle/engine standards.

Island Geography: Hawai‘i's insular nature means that inter-island travel for both people and goods is predominantly by air or sea. This distinguishes its transportation challenges from the continent, where inter-state ground travel is common. The state's population is concentrated primarily on O‘ahu, leading to significant intra-island traffic congestion in urban centers like Honolulu. The reliance on tourism further amplifies transportation demands, with millions of visitors annually utilizing air travel to reach the islands and ground transportation for local movement. The dispersed nature of the islands makes innovative inter-island clean transportation solutions such as electric aircraft and hydrogen ferries critical but complex due to technological maturity and infrastructure requirements.

Import Dependence: Hawai‘i's reliance on imported goods means that emissions from international bunkering activities and international air travel are significant but often excluded from state-level inventories as per IPCC guidelines. Addressing these "upstream" emissions indirectly through policy and collaboration remains a challenge.

High Cost of Living and Energy: The higher cost of electricity and goods in Hawai‘i can impact the affordability and adoption rate of new technologies like EVs and sustainable fuels without strong incentive programs. Even if a household does not own a car they still supplement the cost of ground transportation at a rate of \$33,600 annually. Car owners pay an average of \$21,800 per household, per year on top of that. These costs, \$55,400 annual per car owning household indicate that investments in VMT actions are vital to reduce transportation burdens on residents.

Vulnerability to Climate Impacts: Hawai‘i’s existing transportation infrastructure is highly vulnerable to climate impacts like sea-level rise, coastal erosion, and extreme weather, necessitating significant investment in climate adaptation and resilience alongside decarbonization.

9.3 Numbers and Targets: Current Status and Future Goals

Hawai‘i has set aggressive targets for zero emissions as soon as possible. This means a significant transformation of the transportation sector by 2030 and achieving net-negative emissions by 2045. These targets are legally mandated and form the backbone of the state's Climate Action Plan.

Current GHG Emissions and Energy Use

Transportation sector contributed 10.12 million metric tons of CO₂e to Hawai‘i in 2022. Without new strategies, transportation-related emissions are projected to decrease only marginally to 9.7

million metric tons CO2e by 2045. This highlights a critical gap between current trends and state mandates. This “baseline scenario” underscores the necessity of aggressive mitigation actions to achieve the decarbonization.¹⁷³

Mode	Emissions (MMT CO2e)	Percentage of Transportation Total
Ground	3.47	34.3%
Domestic Marine	0.65	6.4%
Domestic Aviation	4.9	48.4%
Military Aviation	0.77	7.6%
Military Non-Aviation	0.32	3.2%
Total	10.12	100%

Table 30: Emissions and Percentage of Transportation Total, by Mode, 2022.

Key Benchmarks and Milestones

The Plan identifies specific benchmarks for each mode to track progress towards the 2030 and 2045 targets:

Aviation:

- **2030:** Clean Fuel Standard Program operational (SAF Policy passed by Legislature by 2027), 50% of rental cars available at airport are EVs, 50% of parking spaces have access to EV Charging.
- **2040:** Some airplane trips are replaced by electric
- **2045:** Aviation achieves net-zero emissions through widespread adoption of SAF, electrification of ground operations, and the introduction of hydrogen and electric aircraft for inter-island travel. The estimated emission reduction for aviation from strategies (primarily SAF adoption) is the largest share of overall reductions.

Marine:

- **2030:** 50% reduction in overall cruise vessel calls, 75% reduction in >3,000 passenger vessel calls.
- **2035:** 75% reduction in overall cruise vessel calls, 100% reduction in >3,000 passenger vessel calls.
- **2040 and 2045:** Limit cruise vessel calls to 75% below 2023 levels.
- **Overall:** Adoption of clean fuels (biodiesel, bio-LNG, green hydrogen) for intra-state and inter-state marine vessels and commercial harbor crafts is crucial.

Ground Transportation:

- **2028:** 100% of HDOT's light-duty fleet conversion to electric vehicles.
- **2035:** Statewide fleet of light-duty vehicles must be zero-emission (Act 74).

¹⁷³ Ibid.

- **2030 (Estimated):** HECO estimates approximately 3,600 public charging stations and 46,000 private charging stations will be needed. By December 2026, the full implementation of HDOT's NEVI Plan, which includes 13 stations, is on track.
- **2035 (Target):** 100% EV sales for new vehicles.
- **Long-term:** Significant increase in public transit ridership, expansion of bicycle and pedestrian infrastructure, and effective demand management strategies to reduce VMT.

9.4 Challenges and Innovations

The decarbonization of Hawai'i's transportation sector is a complex undertaking, presenting unique challenges stemming from its island geography, economic reliance on tourism, and energy infrastructure. However, these challenges also drive innovative solutions tailored to the state's specific context.

Sector-Specific Challenges

Aviation

- **Sustainable Aviation Fuel (SAF) Supply and Cost:** The biggest challenge for aviation decarbonization is the availability and cost-effectiveness of SAF. While SAF offers significant lifecycle GHG reductions (65-80% compared to conventional jet fuel), its production capacity is currently limited, and it is more expensive. Incentivizing its import and local production requires significant policy and financial mechanisms.
- **Inter-island Aviation Electrification:** While electric aircraft are emerging, commercially viable electric aircraft for inter-island routes with sufficient range and passenger capacity are still in development. Hydrogen aircraft are a long-term prospect.
- **International Aviation Emissions:** Emissions from international flights are not typically included in state GHG inventories, as per IPCC guidelines. However, Hawai'i's heavy reliance on international tourism means these emissions are substantial and represent an external challenge that the state can only influence through advocacy and collaboration with international bodies and airlines.
- **Airspace Modernization:** Optimizing flight paths and air traffic management can reduce fuel consumption, but these efforts require federal collaboration and significant technological upgrades.

Marine Transportation

- **Clean Fuel Infrastructure:** Transitioning marine vessels to clean fuels like biodiesel, renewable LNG, and green hydrogen requires significant investment in bunkering infrastructure at Hawai'i's harbors. The supply chain for these fuels is not yet fully developed.
- **Cost of New Vessels:** Replacing existing fossil-fuel-powered vessels with those capable of running on alternative fuels is capital-intensive, potentially increasing costs for cargo and passenger services, which could impact the cost of living in Hawai'i.
- **Cruise Ship Emissions:** Reducing emissions from cruise ships involves complex negotiations with cruise lines, potentially impacting tourism revenue. Strategies include limiting the number and size of cruise ship calls.

- **International Shipping Emissions:** Similar to aviation, international shipping emissions are largely outside Hawai‘i’s direct regulatory control, making it challenging to reduce their impact on local air quality and the broader climate.

Ground Transportation

- **EV Charging Infrastructure Deployment:** While significant progress is being made, rapidly expanding public and private EV charging infrastructure statewide, especially in rural areas and multi-unit dwellings, remains a challenge. The estimated need for 3,600 public and 46,000 private charging stations by 2030 highlights the scale of this task.
- **Cost of Electric Vehicles:** Despite incentives, the upfront cost of EVs can still be a barrier for many consumers, even though lifetime costs of EVs are typically lower. Programs like tax credits, rebates, and feebate policies for LMI households are crucial to accelerate adoption and equitable deployment of this money saving technology.
- **Vehicle Turnover:** Replacing the existing fleet of internal combustion engine (ICE) vehicles with EVs will take time, even with aggressive sales targets. Policies to incentivize scrappage of older, less efficient vehicles could help.
- **Public Transit Ridership and Infrastructure:** While expanding public transit, bicycle, and pedestrian networks is a priority, shifting deeply entrenched single-occupancy vehicle habits requires significant investment in infrastructure, reliable service, and cultural change.
- **Road Usage Pricing (RUC):** Implementing a road usage pricing system, while effective in reducing VMT and congestion, can face public resistance due to concerns about equity and affordability. Careful design and transparent communication are essential.

Innovations and Opportunities

Aviation:

- **SAF Tax Credits and Coalitions:** Hawai‘i is actively pursuing a Hawai‘i-specific SAF tax credit to incentivize production, blending, and import. HDOT is also leading a multi-stakeholder SAF coalition to build a shared roadmap for SAF adoption, bringing together airlines, fuel producers, farmers, NGOs, and government agencies. This collaborative approach is critical for de-risking investments and accelerating market development.
- **Airfield Electrification:** Airports are implementing strategies to electrify ground service equipment (eGSE) and airfield vehicles, provide pre-conditioned air (PCA) supply and fixed electrical ground power (FEGP) to reduce aircraft auxiliary power unit (APU) usage, and transition to LED lighting for aprons, runways, and taxiways.
- **Hydrogen and Electric Aircraft Exploration:** While long-term, Hawai‘i is actively exploring the potential of hydrogen and electric aircraft for inter-island travel, positioning itself as a testbed for these emerging technologies.

Marine Transportation:

- **Clean Fuels Adoption:** The HDOT Plan champions the adoption of advanced marine fuels like biodiesel and bio-LNG in the near term, with a long-term vision for green hydrogen, for both intra-state and inter-state marine vessels and commercial harbor crafts. This phased approach allows for technological maturation and infrastructure development.

- **Cruise Ship Management:** Implementing regulations to reduce the number and size of cruise ship calls demonstrates an innovative approach to managing environmental impact while still accommodating tourism.
- **Cold Ironing/Shore Power:** A common innovation for harbors is "cold ironing" or shore power, allowing docked vessels to turn off their auxiliary engines and plug into the grid, significantly reducing port-side emissions. This is an area for potential future exploration.

Ground Transportation:

- **Active Transportation Networks:** The planning and constructing of comprehensive bicycle and pedestrian infrastructure networks, coupled with initiatives to promote active transportation, encourages healthier, affordable, and lower-carbon mobility options.
- **Multi-faceted EV Adoption Incentives:** Hawai‘i's strategy goes beyond just charging infrastructure, including financial incentives like tax credits, rebates, and feebate policies to make EVs more affordable. This comprehensive approach addresses various barriers to adoption.
- **NEVI Plan Implementation:** HDOT's aggressive implementation of the National Electric Vehicle Infrastructure (NEVI) Plan, including strategically located fast-charging stations across the islands, is crucial for building public confidence in EV travel.
- **Transit Fleet Electrification:** Converting public transit fleets to electric vehicles, such as buses, significantly reduces emissions in densely populated areas and provides a visible commitment to decarbonization.
- **Innovative Mobility Solutions:** Exploring and supporting innovative mobility solutions, such as micro-mobility, shared mobility services, and intelligent transportation systems, can further reduce reliance on personal vehicles and optimize traffic flow.
- **Road Usage Pricing (RUC):** While challenging to implement, the consideration of RUC is an innovative demand management strategy that can effectively reduce congestion and VMT, generating funds for transportation infrastructure improvements. Road pricing can encourage public transit, bicycling, and walking, and promote carpooling by making peak-hour solo driving more expensive. This indicates a forward-thinking approach to managing traffic demand.
- **Priority Multimodal Network:** The Priority Multimodal Network is a collection of projects on the State highway system that will fill gaps in pedestrian, transit, and bicycle access throughout the islands and reduce VMT.¹⁷⁴ The Network builds upon the many bicycle, pedestrian, and transit plans already developed by HDOT, the Counties, and partners with community input. The network accelerates the timelines of existing plans which provide the foundation, priorities, and vision for a safer, more connected transportation system across Hawai‘i. The Network does not include projects on County roads but seeks to connect State highway multimodal infrastructure to County multimodal infrastructure on County roads. Paired with Transit Oriented Design (TOD) projects the

¹⁷⁴ Hawai‘i Department of Transportation. (2025). *Priority Multimodal Network*. <https://highways.hidot.hawaii.gov/stories/s/5-Year-Priority-Multimodal-Network/4p37-hj62>

Priority Multimodal Network projects will improve walking, biking and busing access for residents and visitors statewide. Improved public transportation is especially important to disadvantaged communities who cannot afford the high cost of driving a personal vehicle in Hawai‘i.

Summary

Hawai‘i’s transportation sector faces substantial, multifaceted challenges in decarbonization. However, the state’s proactive policy environment, coupled with a commitment to innovative technologies and collaborative approaches, positions it as a leader in forging a sustainable transportation future for island communities.

9.5 County-Level Variations and Actions

While the HDOT leads the overarching climate action plan for the transportation sector, significant variations exist at the county level, with each of Hawai‘i’s four counties implementing their own complementary actions and targets. These local efforts are crucial for addressing unique regional challenges and opportunities within the statewide framework. The overarching state targets for GHG reduction and energy efficiency apply to all counties, but each county contributes through specific initiatives tailored to its local context. The Hawai‘i Department of Health (DOH) develops county-level GHG emissions estimates as part of its ongoing inventory efforts, which will provide more granular data for future planning.

Electric Vehicle (EV) Adoption and Infrastructure

- **Public Charging:** Counties collaborate with HDOT, Hawaiian Electric Company (HECO), and the Hawai‘i State Energy Office (HSEO) to identify suitable locations for public EV charging stations on public lands and rights-of-way. For example, the HDOT NEVI Plan includes identified sites on Maui, O‘ahu, Kaua‘i, and Hawai‘i Island, with the first two NEVI-funded stations opening on Maui and O‘ahu in 2024. Each County also provides public charging for their communities.
- **Private Charging:** Counties may implement zoning regulations or building codes that encourage or require EV charging infrastructure in new residential and commercial developments. The County of Kaua‘i amended the zoning and building code in 2022 to provide requirements for EV-ready and EVSE installed for new buildings and substantial remodels.
- **Fleet Electrification:** Counties are also working to electrify their municipal fleets, aligning with state goals for zero-emission government vehicles.¹⁷⁵ The City and County of Honolulu aims to convert all City vehicles to electric by 2035.¹⁷⁶

Public Transit Expansion and Modernization

¹⁷⁵ Kaua‘i Kakou General Plan 2018 for the County of Kaua‘i <https://www.kauai.gov/Government/Council/General-Plan-Update>

¹⁷⁶ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (n.d.). *Transportation: Greening the City Fleet*. <https://www.resilientoahu.org/transportation>

Counties manage and operate local public transit systems.

- **City and County of Honolulu (CCH):** CCH’s Department of Transportation Services (DTS) operates TheBus, The HandiVan and the Skyline rail. The rail project aims to reduce traffic congestion and GHG emissions on O‘ahu. CCH continues to invest in modernizing its bus fleet, with 17 electric buses already in service and plans to electrify its heavy-duty vehicle fleet.¹⁷⁷
- **Kaua‘i County:** The County of Kaua‘i operates the Kaua‘i Bus which services residents and visitors, providing both fixed route and paratransit services. The Kaua‘i Bus has gone through several recent initiatives modernizing their system, including upgrading to an e-fare system, as well as electrifying their fleet in 2025. The Kaua‘i Bus aims to increase frequency and routes to reach more riders.
- **Hawai‘i County’s** Hele-On system and the **Maui County’s** Maui Bus system are undergoing substantial expansion and modernization to meet the statewide mandate of achieving a 100% zero-emission public transit bus fleet by 2030. Both counties are accelerating decarbonization through the joint deployment of new zero-emission buses, supported by Federal Transit Administration grants and state funds, aligning transportation networks with the goal of reducing vehicle miles traveled and enhancing community resilience.
- **Multimodal Connectivity:** Counties are focused on improving connectivity between different modes of transport, such as integrating bus routes with rail stations, park-and-ride facilities, and active transportation networks, even exploring mobility hubs, with the County of Kaua‘i having recently completed the Coconut Marketplace Mobility Hub Plan, and several mobility hub planning efforts underway being led by the Oahu Metropolitan Planning Organization.

Bicycle and Pedestrian Infrastructure

Counties play a critical role in developing and maintaining active transportation networks.

- **Dedicated Lanes and Paths:** Counties are investing in creating safe and extensive bicycle lanes, shared-use paths, and pedestrian walkways to encourage walking and cycling for commuting and recreation. Honolulu, for example, is finalizing new protected bike lanes as part of its Complete Streets program.¹⁷⁸
- **Safe Routes to School:** All the counties have programs aimed at creating safer routes for children to walk and bike to school, especially in historically marginalized communities, addressing both safety and equity concerns.
- **Urban Planning:** County-level land use planning and zoning ordinances promote compact, mixed-use, and transit-oriented development (TOD) to reduce vehicle miles traveled (VMT) and encourage walking and cycling.

¹⁷⁷ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (n.d.). *Transportation: TheBus is Driving to a Clean Energy Future*. <https://www.resilientoahu.org/transportation>

¹⁷⁸ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (n.d.). *Climate Action Plan: Action Is Already Underway - Ward Avenue Protected Bike Lanes*. <https://www.resilientoahu.org/climate-action-plan>

Road Usage Pricing and Demand Management

While a statewide initiative, counties are critical in the potential implementation and public acceptance of road usage pricing (RUC) mechanisms.

- **Congestion Management:** Counties with significant traffic congestion, particularly Honolulu, are keen on exploring RUC as a tool to manage demand, reduce peak-hour travel, and generate revenue for transportation infrastructure. The state Plan highlights RUC's ability to encourage public transit, carpooling, and off-peak travel.
- **Local Implementation:** Any statewide RUC program would require close collaboration with counties for local enforcement, infrastructure adaptation, and public outreach to ensure equitable impacts and smooth implementation.
- **VMT Reduction Targets:** The City and County of Honolulu has set VMT reduction targets of 10%, with aspirations for 20% and 30%, to reduce emissions and congestion.¹⁷⁹ The County of Kauaʻi, as outlined in its General Plan, has adopted mode shift goals to reduce annual VMT per capita by 18% between 2010 and 2035. This target is expected to be met through modest but steady shifts in travel behavior, with more trips made by transit, walking, and cycling, and fewer by single-occupant vehicles.¹⁸⁰

Local Climate Action Plans and Initiatives

Each county has transportation-specific strategies outlined in Climate Action and County transportation plans.

- **City and County of Honolulu** adopted its first Climate Action Plan for 2020-2025, outlining 9 strategies and 47 actions to reduce GHG emissions by 45% by 2025 (relative to 2015 levels) from transportation, electricity, and waste sectors, with a long-term goal of carbon neutrality by 2045. Ground transportation accounts for approximately 19% of Oʻahu's GHG emissions.¹⁸¹
- **Hawaiʻi County Integrated Climate Action Plan (ICAP):** Hawaiʻi County has an Integrated Climate Action Plan that includes clean transportation as a key area. The 2015 GHG inventory for Hawaiʻi County showed transportation and mobile sources as the largest emission sector, representing 53.38% of total emissions. Their ICAP aims to reduce the County's contribution to global GHG emissions and increase the resilience of county infrastructure.¹⁸²
- **The County of Maui** is supported by the Maui Metropolitan Planning Organization that recently approved the Hele Mai Maui 2045 Long-Range Transportation Plan, a 20-year plan for the island's transportation system. The plan aims to make mobility safer, more efficient and sustainable, for all ages and abilities.¹⁸³

¹⁷⁹ City and County of Honolulu. (May 25, 2024). *2024 Energy Conservation and Emissions Reduction Plan for Transportation*. p. 5. https://oahumpo.org/?wpfb_dl=3289

¹⁸⁰ Kauaʻi Multi-Modal Land Transportation Plan (2013), available at: <https://www.kauai.gov/files/assets/public/v/1/transportation/documents/kauai-mltp-council-adopted-version.pdf>

¹⁸¹ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (n.d.). *Climate Action Plan*. <https://www.resilientoahu.org/climate-action-plan>

¹⁸² County of Hawaiʻi. (2023). *Integrated Climate Action Plan (ICAP)*. pp. 7-10. [https://records.hawaiicounty.gov/WebLink/1/edoc/135070/County%20of%20Hawaii%20-%20Integrated%20Climate%20Action%20Plan%20\(2023\).pdf](https://records.hawaiicounty.gov/WebLink/1/edoc/135070/County%20of%20Hawaii%20-%20Integrated%20Climate%20Action%20Plan%20(2023).pdf)

¹⁸³ Maui Metropolitan Planning Organization. (2025) Hele Mai Maui 2045 Long-Range Transportation Plan <https://www.mauiimpo.org/long-range-transportation-plan?>

- **The County of Kaua‘i** adopted the Kākou General Plan in 2018 including actions to discouraging development away from town centers to avoid residents commuting via automobile to jobs in other areas of the island. Kaua‘i Multimodal Land Transportation Plan, adopted in 2013, outlines the steps necessary to achieve a sustainable multimodal transportation system through 2035. Transportation challenges identified in the plan include an increasing demand for public transit, and a lack of mobility options when traveling between urbanized areas, and a lack of safe active transportation facilities. The reduction of VMT per capita is listed as a means of achieving a more balanced, sustainable transportation system.

Challenges in County-Level Implementation

- **Funding:** Counties often face budget constraints, making significant investments in new transportation infrastructure and technologies challenging without state or federal support.
- **Coordination:** Ensuring seamless coordination between state and county transportation agencies, as well as with utility companies and private sector partners, is crucial for efficient project delivery.
- **Data Granularity:** Improving data collection processes for more granular and focused emissions quantification at the county level is essential for better planning and tracking progress.

Despite these challenges, the decentralized approach, with strong state guidance and county-level implementation, allows for tailored solutions that best fit the unique needs and characteristics of each island and community, collectively contributing to Hawai‘i’s ambitious transportation decarbonization goals.

9.6 Measure Description and GHG reduction

Ground Transportation

Measure: Rental Vehicle Electrification

Rental vehicles are estimated to account for 662,000 MT CO₂e annual across the state, growing to 886,000 MT CO₂e by 2045 under tourism projections of 1.5% annual growth. *Table 31 shows the estimated growth in average daily tourist census for the islands.*

Daily Visitors	2026	2030	2035	2040	2045
O‘ahu	105,350	112,150	120,820	130,150	140,210
Maui	70,960	75,540	81,380	87,670	94,450
Kaua‘i	30,410	32,370	34,880	37,570	40,470
Hawai‘i Island	40,080	42,670	45,970	49,520	53,350
Total daily visitors	246,800	262,730	283,050	304,910	328,480

Table 31: Estimated Daily Visitors, in milestone years.

It is estimated that these visitors drive 2,092,000 miles in rental vehicles each day across the islands, on average. *Table 32 summarizes the total annual VMT of rental vehicles by island, which are extrapolated from travel surveys performed in O‘ahu in 2024.*^{184, 185}

VMT (millions)	2026	2030	2035	2040	2045
O‘ahu	768	818	881	949	102
Maui	517	551	593	639	69
Kaua‘i	222	236	254	274	30
Hawai‘i Island	292	311	335	361	39
Total annual VMT	1,799	1,916	2,064	2,223	239

Table 32: Estimated annual millions of VMT driven by rental vehicles across the state for milestone years.

Driven by gasoline vehicles, these annual VMT produce GHG emissions as summarized in the following table.

¹⁸⁴ City and County of Honolulu. 2024. *2024 Oahu Visitor Survey Final Report*. Accessed October 28, 2025: https://oahumpo.org/?wpfb_dl=3444

¹⁸⁵ This data was assessed and summarized by Dr. Xiaofeng Li, Assistant Professor of Transportation Management at University of Hawai‘i at Mānoa in a personal communication, October 28, 2025.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
O‘ahu	0.284	0.303	0.326	0.351	0.378	6.6
Maui	0.191	0.203	0.220	0.236	0.255	4.6
Kaua‘i	0.082	0.087	0.094	0.101	0.109	1.9
Hawai‘i Island	0.108	0.115	0.124	0.134	0.144	2.5
Total annual rental car emissions	0.665	0.708	0.764	0.822	0.886	15.6

Table 33: Annual GHG emissions from rental vehicles by island for milestone years.

Emissions Reductions

Replacing all rental vehicles with EV models by 2045 would help reduce emissions in this sector by 0.886 MT CO₂e in that year. Cumulative emissions reductions in the rental vehicle sector would be 10.74MT CO₂e between 2026 and 2045 as rental EVs are phased in. Milestone year reductions are summarized in the following table. The following figure shows the emissions reduction trajectory in the rental car sector.

Reductions (MMT CO ₂ e)	2026	2030	2035	2040	2045	Cumulative 2026-2045
O‘ahu	-0.036	-0.114	-0.224	-0.351	-0.378	-4.6
Maui	-0.023	-0.077	-0.152	-0.237	-0.255	-3.1
Kaua‘i	-0.010	-0.033	-0.065	-0.101	-0.109	-1.3
Hawai‘i Island	-0.014	-0.043	-0.085	-0.134	-0.144	-1.7
Total annual rental EV reductions	-0.083	-0.266	-0.525	-0.823	-0.886	-10.7

Table 34: Annual GHG emissions reductions from replacing rental vehicles with EV models, by island for milestone years.

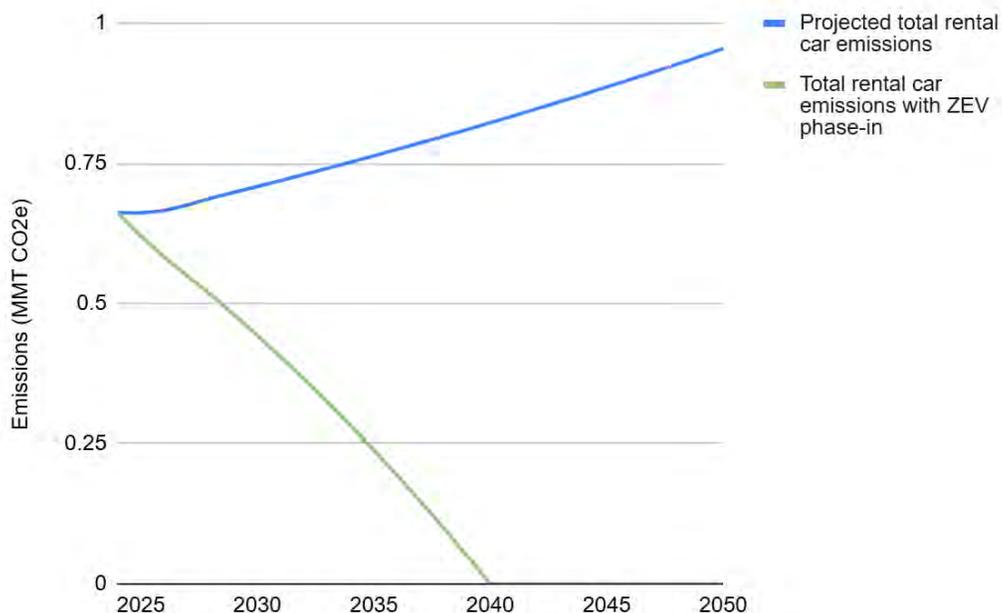


Figure 25: Projected rental vehicle emissions versus emissions if 100% of gas rental vehicles are replaced with electric models by 2040.

Co-pollutant Reductions

Reductions in gasoline use that accompany rental vehicle EV replacement results in direct co-pollutant reductions, as summarized in Table 35.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
NOX	-40.8	-74.6	-137.7	-197.8	-213.1	-2,772
PM2.5	-1.3	-3.4	-6.2	-8.9	-9.6	-123

Table 35: Co-pollutant reductions from replacing rental vehicles with EV models for milestone years.

Measure: Clean Fuels and Electric Vehicles

Gasoline use will decrease as electric vehicles make up more of the total personal vehicle stock. The emissions from the remaining gasoline-powered vehicle stock can be reduced by using cleaner fuels. Ethanol is the go-to biofuel added to gasoline to reduce vehicle emissions. It is produced by fermenting organic materials like wheat, corn, sugarcane, and cellulose. Existing vehicle engines burn ethanol-gasoline mixtures similarly to gasoline on its own. With minor modifications, engines can burn mixtures with high ratios of ethanol.

Many jurisdictions in the US and internationally mandate ethanol-gasoline blends between 5% (“E5”) and 20% (“E20”). Higher blends are often available as well. Hawai‘i can support ethanol use through measures like:

- Supporting a clean fuel standard, carbon tax or other legislation to increase clean fuel use. This could include revisiting the ethanol blend mandate the state had between 2006-2015.

- Developing local capacity to produce ethanol, using existing crops such as sugar cane.

The following table summarizes emissions in the vehicle sector.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Vehicle emissions	4.19	3.99	3.50	2.85	1.99	66.2

Table 36: Baseline Emissions Levels for Light-duty Vehicles in Milestone Years.

Emissions Reductions

The effect of accelerating EV uptake and using clean fuels was modeled to determine the emissions reduction potential.

Assumptions

- As population and vehicle ownership increase, total vehicle miles traveled increases 0.67% annually, on average.
- Gasoline-powered vehicles phase out and are replaced by battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV).
- 100% of new vehicle sales are EV models by 2045.
- By 2045, gasoline-powered vehicles make up 0% of the total vehicle stock.
- Ethanol blend is increased between 10% in 2025 and 50% in 2045.
- Ethanol blend fuels affect the emissions of gasoline-powered and PHEV vehicles only.
- Ethanol use is considered carbon neutral, thus the ethanol value in fuel mixes reduces emissions by roughly that percentage (e.g., E25 = 25% emissions reduction).
- Ethanol availability is assumed to be ubiquitous and present in all gasoline mixes on the islands simultaneously, rather than being phased in.

Table 37 summarizes emissions reductions for the light duty vehicle sector using a 25% ethanol blend with gasoline by 2040.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Emission reductions 100% EVs and 50% ethanol blend by 2045	-0.82	-1.36	-1.66	-1.54	-0.99	-27

Table 37: Emissions Reductions in Light-duty Vehicles from Accelerated EV uptake and Ethanol Fuel Blends in Milestone Years.

Figure 26 depicts the emissions effect of increasing EV presence and using ethanol blend for remaining gasoline vehicle stock. Projected vehicle emissions decrease under the standard outlook as some expected EV uptake and improved fuel efficiency standards are assumed.

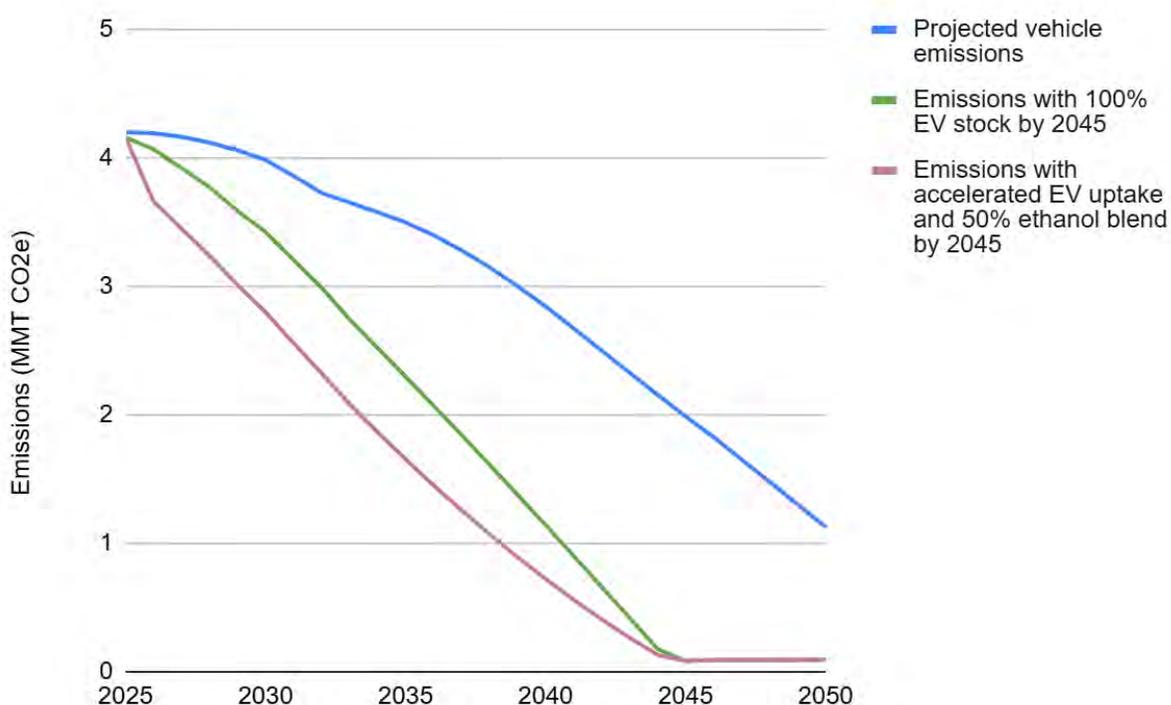


Figure 26: Projected Light-duty Vehicle Stock Emissions versus emissions with 100% EV stock by 2045 versus Blending 50% Ethanol into Gasoline for Remaining Gasoline-Powered Vehicles.

Co-pollutant Reductions

Reductions in gasoline use that accompany EV uptake and a 50% ethanol blend results in direct co-pollutants reductions, as summarized in the table below.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
CO	-4,404	-6,639	--9,155	10,143	-8,956	-166,378
NOX	-130	167	231	-256	-226	-4,233
PM2.5	-4	-8	-10	-12	-10	-187

Table 38: Co-pollutant Reductions from Increased EV Uptake and Blending 50% Ethanol in Gasoline for Remaining Gasoline-Powered Vehicles, in milestone years.

Measure: Mode Shift

Per vehicle VMT is projected to remain consistent in the future but increased vehicle ownership accompanying population growth will result in an increase in total VMT. This creates continued challenges with vehicle emissions and traffic congestion. VMT reduction measures can help shift trips made by personal vehicle to those made by active transportation or transit.

This action considers four measures:

1. Shifting from vehicle trips to walking, biking, and rolling trips is supported by actions like:
 - Implementing a 5-year priority multimodal network;
 - Implementing bicycling & walking initiatives/pilots (e.g., county transit free for youth, dedicated lanes/streets, rebates, etc.); and
 - Continuing the expansion of bicycling and pedestrian infrastructure & maintenance programs.

2. Shifting from vehicle trips to transit trips is supported by actions like:
 - Implementing a unified payment app for transit on all islands;
 - Creating transit initiatives/pilots (e.g., county transit free for youth) incentivizing the use of public transport by school age students; and
 - Continuing improvements to intra-city public transit service network and infrastructure.

3. Road pricing program implementation is supported by actions like:
 - Assessing which urban areas suffer from traffic congestion and determining what the options are for road pricing geographic boundaries and how mode shift can be supported by accompanying improvements in transit services and active transportation infrastructure;
 - Determining road pricing fees; and
 - Implementing financing programs for transit and active transportation, funded by road pricing fees.

4. Complete, compact communities land use planning approaches include:
 - Site development potential analyses to determine infill strategies;
 - Affordable housing needs assessments and development strategies;
 - Transit-oriented development potential assessments; and
 - Parking minimums reduction and EV charging requirements in new building developments.

Table 39 summarizes the baseline emissions for the light-duty vehicle sector.

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Vehicle emissions	4.19	3.99	3.50	2.85	1.99	66.2

Table 39: Baseline Light-duty Vehicle Emissions in Milestone Years.

Emissions Reductions

The measures described above were modeled to determine their potential emissions reductions. A target of 20% mode shift from personal vehicle trips to other transportation modes was set.

Assumptions

- All mode shift occurs from light duty vehicle (LDV) trips to transit and active transportation modes. LDVs use gasoline, electricity, or a combination.
- Assume transit fuel is carbon neutral (e.g., biodiesel). Shifting trips to transit reduces those trip emissions to zero.
- As population and vehicle ownership increase, total vehicle miles traveled increases 0.67% annually, on average.
- Urban densification results in increased active transportation trips.
- Road pricing acts as a personal vehicle use deterrent.
- Each element achieves roughly the same share of target VMT reduction (i.e., 5%).
- Mode shift percentage translates to VMT reduction percentage (i.e., 20% mode shift to transit and active transportation modes = 20% fewer VMT).

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Emissions reduced from mode shift actions	-0.033	-0.160	-0.280	-0.342	-0.318	-4.9

Table 40: Light-duty Vehicle Emissions Reductions from VMT reduction measures in Milestone Years.

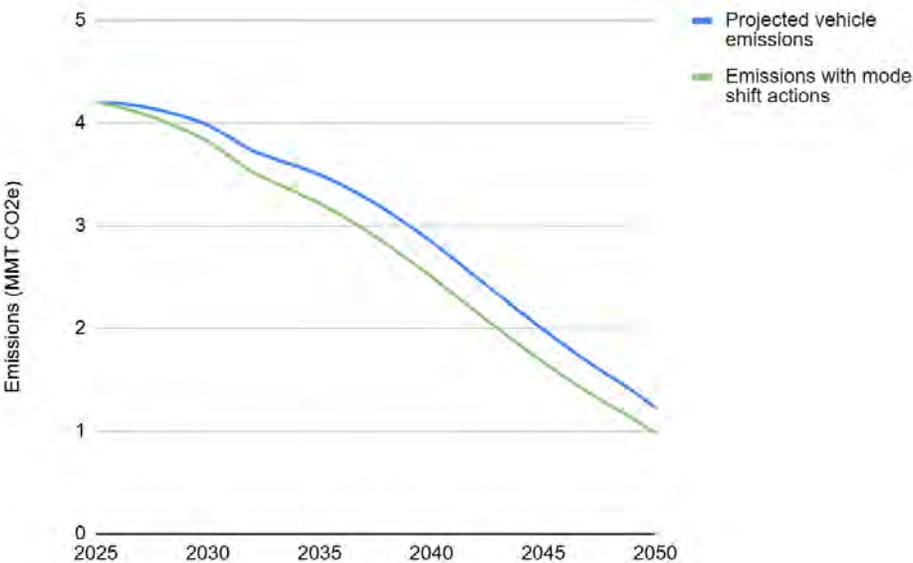


Figure 27: Light-duty Vehicle Emission Reductions from Mode Shift Actions.

Similarly to the trajectory of emissions reductions achieved using ethanol blending, decreased VMT has slightly lesser emission reduction effects as time goes on, as vehicles are increasingly electrified and fuel efficient.

Co-pollutant Reductions

Reductions in gasoline use that accompany travel mode shifts results in direct co-pollutants reductions, as summarized in the table below.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
NOX	-7.8	-27.3	-47.9	-58.3	-54.2	-851
PM2.5	-0.3	-1.2	-2.2	-2.6	-2.4	-38

Table 41: Co-pollutant reductions from shifting 20% of trips from cars to transit and active transportation, in milestone years.

Aviation Transportation

Aviation emissions (domestic and military) are a new challenge for the state, excluded from Hawai‘i’s GHG emissions reduction goal established in Act 234 of 2007, Act 238 of 2022 introduced a GHG emissions reduction target including aviation emissions. Domestic aviation made up almost 50% of transportation emissions in 2021, 55% including military flights. Reducing emissions in aviation is a considerable challenge that requires close collaboration with the aviation industry, energy producers and federal government regulators.

The following table illustrates baseline emissions from aviation.

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Air travel emissions	5.51	5.65	5.75	5.82	5.89	114.7

Table 42: Baseline Projected Aviation Emissions for Milestone Years.

Measure: Sustainable Airline Fuel Blend

Sustainable aviation fuels (SAF) are the cornerstone of aviation decarbonization. SAF has a lower carbon intensity than regular jet fuel, since it is made from renewable biomass and waste resources. It is expected that SAF will make up 2% of U.S. jet fuel consumption in 2026.¹⁸⁶ Adopting 100% SAF content in aviation fuels by 2045 was modeled to determine its emissions reduction potential.

¹⁸⁶ Annual Energy Outlook 2025 - U.S. Energy Information Administration (EIA)
<https://www.eia.gov/outlooks/aeo/>

Adopting a higher share of SAF considers the following supporting actions:

- Developing necessary policies, such as clean fuel standards, tax credit, carbon tax or other legislation to increase SAF affordability and use.
- Advising and participating in an SAF industry working group that meets quarterly and addresses barriers to meeting SAF goals and targets.
- Assessing existing infrastructure, Supply Chain and Distribution Pathways for SAF.
- Monitoring developments in scale-up of zero carbon fuels such as eSAF and green hydrogen.
- Engaging with airlines regarding use of aircraft powered by zero carbon fuels for intra-island flights, such as green hydrogen.

Emissions Reductions

The emissions reduction effects of increasing SAF to a 100% blend by 2045 are shown in the following table and figure. SAF is assumed to be carbon neutral. Adoption of 100% SAF blend reduces aviation emissions correspondingly (i.e., 100% SAF blend results in 100% fewer aviation emissions). SAF blend has a very large cumulative emissions reduction between 2026 and 2045 as it is phased in.

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Air travel emission reductions using 100% SAF by 2045	-0.07	-1.37	-2.83	-4.31	-5.82	-59.3

Table 43: Emission Reductions using 100% Sustainable Airline Fuel Blend by 2045, for Milestone Years.

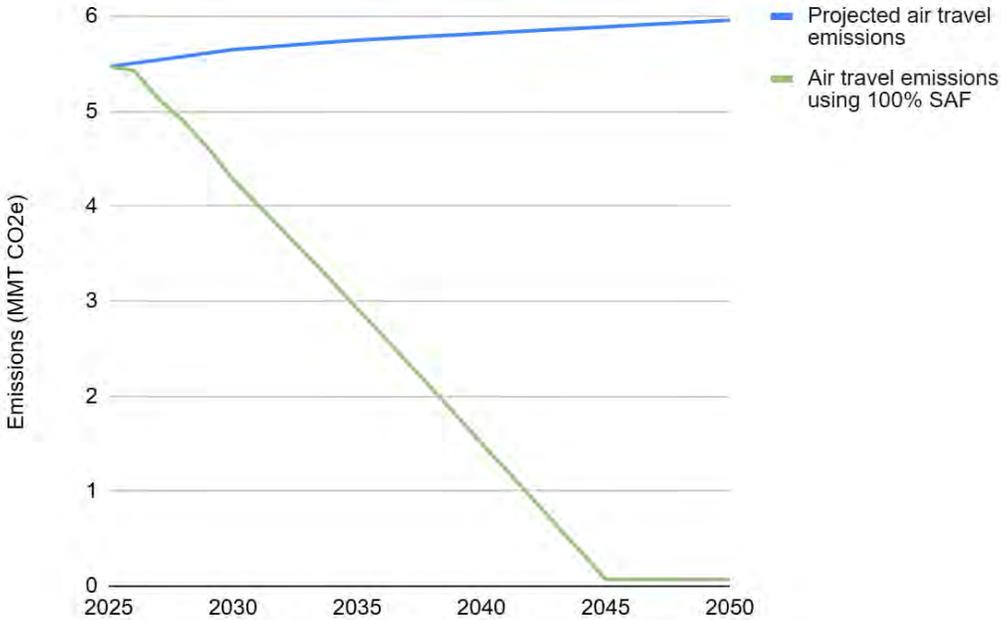


Figure 28: Emissions Reductions Using 100% Sustainable Aviation Fuels by 2045.

Co-pollutant Reductions

Using SAFs results in direct co-pollutants reductions from reduced standard aviation fuel use, as summarized in the table below.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
CO	-125	-1,920	-3,942	-6,004	-8,102	-124,034
NOX	-245	-3,746	-7,693	-11,718	-15,813	-242,067

Table 44: Co-pollutant reductions from using 100% SAF by 2045, in milestone years.

Measure: Air Travel Electrification

Planes could potentially use batteries to achieve electric aviation, but current battery technologies are typically too heavy to make electric flight viable. A proposal to replace some inter-island flights with sea glider technology could potentially electrify some aviation trips and reduce emissions. Sea gliders are small plane-like vessels that use airplane wing and hydrofoil technologies. They use batteries to power an array of electric motors along their wings.

Emissions Reductions

The emissions reduction effects of using sea gliders are shown in the following table and figure. It is assumed that 1% of total aviation trips can viably be replaced with sea glider trips. Electricity used for flight is assumed to be provided by renewable sources.

MT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Electric aviation emissions reductions	-5,405	-18,233	-37,667	-57,500	-58,200	-730,000

Table 45: Emission Reductions from shifting 1% of total flights to sea gliders by 2040, for Milestone Years.

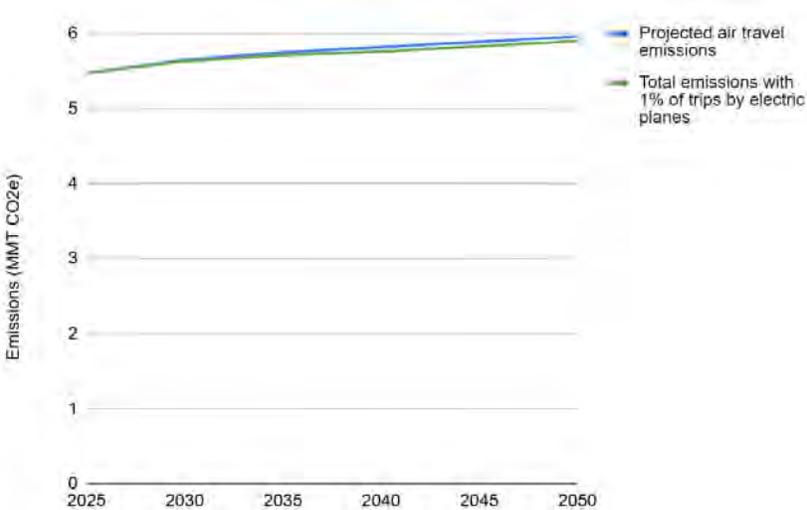


Figure 29: Emissions reductions from replacing 1% of flights with electric sea glider trips.

Co-pollutant Reductions

Using electric aviation results in direct co-pollutants reductions from reduced standard aviation fuel use, as summarized in the table below.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
NOX	-8	-50	-103	-156	-158	-2,000
PM2.5	-6,270	-7,650	-7,830	-7,930	-8,020	-154,250

Table 46: Co-pollutant reductions from using 30% SAF blend in aviation fuels, in milestone years.

Other Aviation Measures

Other measures to reduce aviation emissions include reducing fuel consumption in airplanes and ground operations and increasing taxation on private flights. These were not quantified due to lack of data, but supporting actions can be described as:

- Reducing fuel consumption by:
 - Revising airline scheduling to stagger departures and arrivals to reduce idling.
 - Optimizing aircraft ramp movements to prevent congestion and delays.
 - Completing and implementing an airspace modernization strategy.
 - Expanding the number of gates to reduce aircraft idling time following landing.
- Taxation of private flights:
 - Impose a fee for every arrival, departure or use of airspace of a private jet into a Hawaiian airport.
 - Levy a tax proportional to hours flown while in or into Hawai‘i.
 - Increase state jet fuel tax rate or add a surcharge for refueling in Hawai‘i.
 - Impose a property or registration tax for private jets registered in the state.
 - Impose a use or excise tax.
 - Add a “luxury jet tax” or emissions surcharge (e.g. per kg CO₂, or per noise class).
 - Create a higher GET rate for private jet charter services or related services.

Marine Transportation

Domestic marine transportation emissions were 5.4% of total transportation emissions in 2021. These emissions can be reduced by using cleaner fuels as well as by decreasing fossil fuel consumption with more efficient use of energy in cruise ships. In the near term, use of renewable fuels in marine vessels can occur via adopting biodiesel in intra-island vessels, using bio-LNG in interstate vessels, and using biodiesel in harbor crafts. In the long term, e-methanol, e-ammonia, and green hydrogen, once produced at scale, can be used as sustainable marine fuels.

The following table illustrates baseline emissions of domestic and international marine transportation. Domestic emissions projected in the latest inventory are expected to increase 34% from current levels by 2050. International bunker fuel use emissions for marine transportation are not projected in the inventory and are assumed to be constant.

MMT CO ₂ e	2026	2030	2035	2040	2045
Domestic marine activity emissions	0.65	0.69	0.75	0.80	0.86

Table 47: Marine Vessel Baseline Emissions in Milestone Years.

Measure: Marine Fuel Decarbonization

Sustainable marine fuels (SMF) reduce emissions by replacing standard marine diesel with biodiesel. Biodiesel is assumed to be carbon neutral for the purposes of these calculations.

Emissions Reductions

Switching to a biodiesel blend of 100% by 2045 was modeled to determine its emission reduction effects. Since biodiesel is assumed to be carbon neutral, the percentage of its blend results in a corresponding reduction in emissions (i.e., 25% SMF = 25% marine vessel emissions reductions). The table and figure below summarize the emission reduction effects of this action.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
SMF emissions reductions	-0.03	-0.17	-0.38	-0.60	-0.86	-8.3

Table 48: Marine Vessel Emission Reductions from 100% Sustainable Marine Fuel Use by 2045, in Milestone Years.

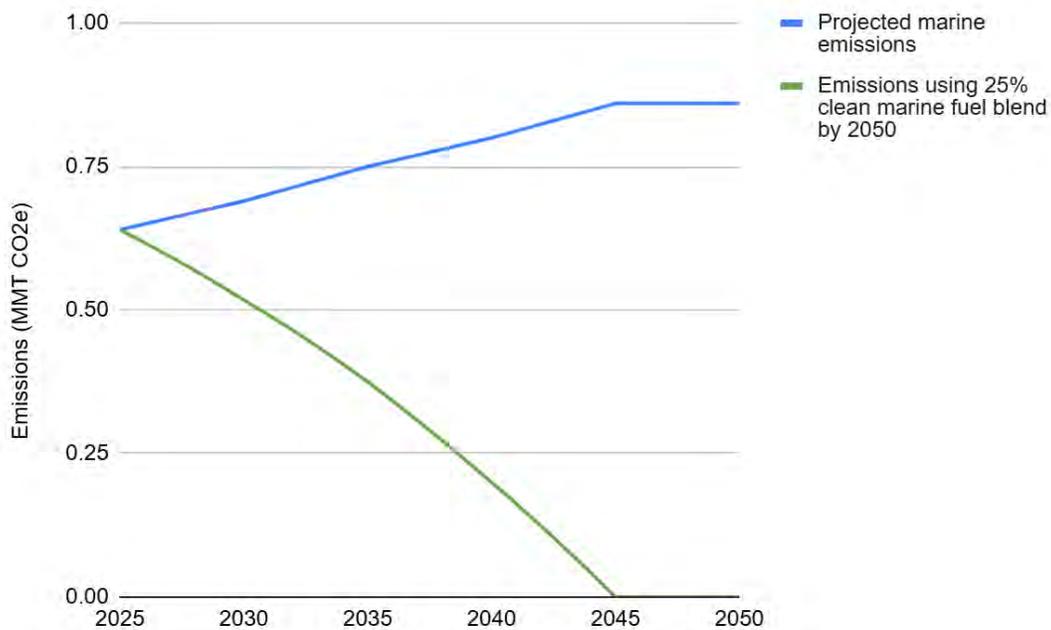


Figure 30: Projected Marine Vessel Emissions versus Emissions from using 25% Sustainable Marine Fuel Use by 2040.

Co-pollutant Reductions

Replacing standard marine fuel with SMF results in direct co-pollutants reductions, as summarized in the table below.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
NOX	-0.14	-0.73	-1.59	-2.54	-3.64	-53.20

Table 49: Co-pollutant reductions from using 100% SMF blend in marine fuels by 2045, in milestone years.

Measure: Cruise Ship Efficiency and Sustainable Fuels

More efficient use of cruise ship engines and use of sustainable fuels can reduce emissions from marine fuel use in international marine travel. This typically means decreasing onboard energy consumption through energy efficiency measures, eliminating in-port idling, using shore power instead on onboard power, and replacing standard fuels with sustainable fuels. Hawai'i may also limit cruise ship calls, making local emissions from cruise ships plateau in coming years, as seen in the following tables.

MMT CO ₂ e	2026	2030	2035	2040	2045
Emissions from the local component of international cruise ship activity	0.08	0.08	0.08	0.08	0.08

Table 50: Local component of international cruise ship activity emissions, in milestone years.

Emissions Reductions

Achieving 5 gCO₂e/MJ of energy use was modeled to determine the emission reduction potential of cruise ships being more efficient and using clean fuels. The table and figure below summarize the results.

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Emissions reductions from achieving 5 gCO ₂ e/MJ for cruise ship operations by 2045	-0.00378	-0.01814	-0.03627	-0.05441	-0.07254	-0.76184

Table 51: Emissions reductions from achieving 5 gCO₂e/MJ for cruise ship operations by 2045, in Milestone Years

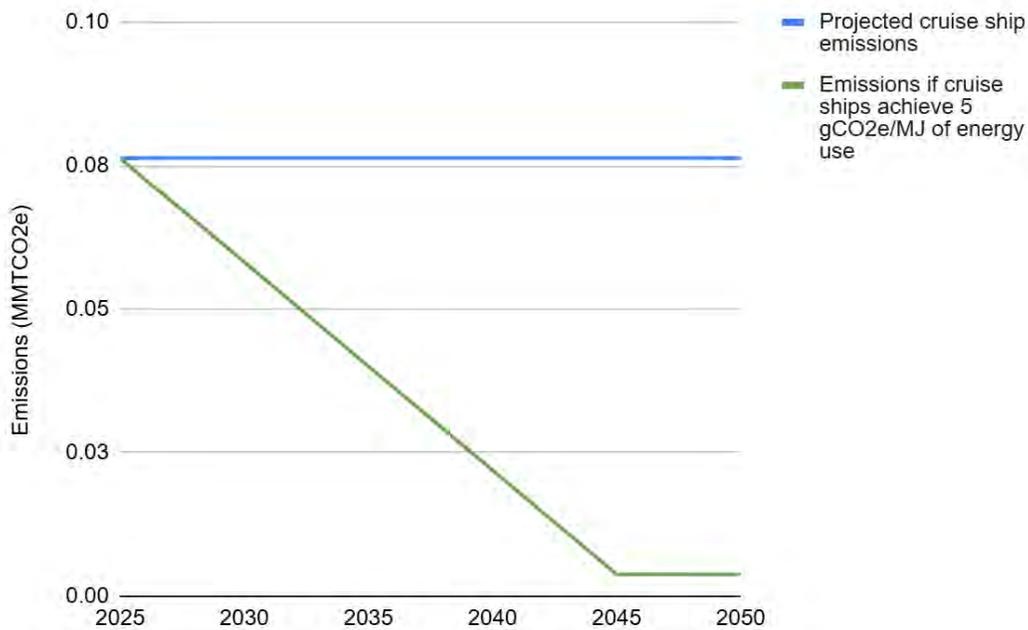


Figure 31: Projected emissions from international cruise ship operations to and from Hawai‘i versus the emissions from cruise ships if they achieve 5 gCO₂e/MJ of energy use or lower.

Co-pollutant Reductions

Increasing the efficient operation of cruise ships decreases marine fuel use, resulting in co-pollutants reductions, as summarized in the table below.

Co-pollutant (MMT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
NOx	-0.08	-0.40	-0.81	-1.21	-1.62	-17.00

Table 52: Co-pollutant reductions from cruise ships achieving operations emitting 5 gCO₂e/MJ, in milestone years.

9.7 Key Agencies

Hawai‘i Department of Transportation is the primary driver of policies and programs that reduce emissions in ground, air, and marine transportation within the limits of federal law. Under HRS §286, §291C, §264, §279D HDOT has authority over, state highways, traffic safety, bicycle and pedestrian planning and the State transportation system management. Their mission statement recognizes their obligation to preserve Hawai‘i’s clean and healthful environment, reflecting a holistic approach to transportation that extends beyond traditional operational metrics like traffic flow or infrastructure maintenance. Their key functions in this space are expanding statewide EV charging infrastructure, state fleet electrification under Act 74 (2021) and Act 23(2023), transit electrification support for counties, VMT reduction strategies, zero-emission bus transition coordination with county fleets, and inter-island marine and air transportation planning. HDOT is also responsible for Act 226 (2023) planning for zero-emission inter-island transportation.

Hawai‘i Department of Health (DOH) – Clean Air Branch is the regulator of transportation-related air pollutants and GHG monitoring. While federal law precludes DOH from regulating vehicle tailpipe GHG standards, it enforces Clean Air Act requirements in Hawai‘i, operates statewide air-quality monitoring (PM_{2.5}, NO_x, ozone, CO), and regulates emissions from transportation-linked facilities such as airports, harbors, fuel storage, and marine terminals. DOH produces the statewide GHG inventory the baseline for all state decarbonization planning.

Public Utilities Commission (PUC) regulates the electric utility which has impacts as the transportation sector electrifies, especially the increase of demand due to EV charging. The PUC approves electrification-of-transportation programs by Hawaiian Electric, oversees grid upgrades needed for EV charging, sets policies enabling EV charging investment and rates, and guides utility resource planning ensuring enough renewable generation to serve EV load

Hawai‘i State Energy Office (HSEO) provides the statewide decarbonization strategy and supports transportation actions. HSEO’s establishing statute Act 122 (2019) gave powers to coordinate clean transportation, EV adoption, and energy-transition planning. Act 238 (2022) identifies HSEO as statewide lead on the Decarbonization Strategy under this law.

Federal Agencies regulate what Hawai‘i cannot. U.S. Environmental Protection Agency (EPA) sets national vehicle GHG and fuel-economy standards, and co-regulates aircraft and marine vessel emissions. U.S. Department of Transportation, Federal Transit Administration (FTA) provides major funding for county bus electrification and regulates transit fleet requirements. Together the Federal Aviation Administration (FAA) & U.S. Coast Guard govern aviation and marine sectors, which are major contributors to Hawai‘i’s emissions.

City and County of Honolulu (CCH) has the most extensive public transit system, including TheBus and the newly operational Skyline. CCH also manages Biki bikeshare, a large-scale bikeshare system launched in 2017 which has become another public transportation option. Due to high population density and traffic congestion, CCH often leads in adopting advanced transportation solutions and demand management strategies.

Hawai‘i County is largest island geographically, characterized by a more rural landscape with expanding urban centers. Transportation challenges often involve longer distances and reliance on personal vehicles. Hawai‘i County also has a free public bus system and bikeshare options are available in Hilo and Kona.

County of Maui includes the islands of Maui, Moloka‘i, and Lāna‘i. Maui is a significant tourist destination with a growing population. Transportation planning focuses on balancing tourism needs with resident mobility and environmental protection. Like the other counties, Maui also has a public bus transportation system.

County of Kaua‘i the islands of Kaua‘i and Ni‘ihau. Local transportation efforts prioritize planning and building safe, multimodal networks while maintaining existing roads and bridges. The County has adopted a Complete Streets policy and a Living Streets Roadway Design Manual, ensuring that facilities for pedestrians, cyclists, and transit riders are considered in every roadway project. The community is passionate about sustainable tourism in the transportation system, leading shuttle efforts allowing visitors to get out of cars.

Kaua'i Island Utility Cooperative incentivizes the electrification of transportation transition and offers rebates for electric vehicle charging stations.

9.8 Implementation Schedule and Milestones and Metrics for Tracking Progress

GROUND TRANSPORTATION		
Action	Schedule	Metrics
7. RENTAL VEHICLES ELECTRIFICATION	All rental vehicles are electric models by 2040.	Percentage of total rental stock that is EV.
8. FUEL DECARBONIZATION and ACCELERATED EV UPTAKE	2045: All new vehicles sales are ZEVs. 2045: gasoline-powered vehicles make up 0% of the total vehicle stock, due to their replacement with battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV). Use an ethanol blend for remaining gasoline consumption of LDVs starting at 10% in 2026 and increasing to 50% by 2045.	Number of battery electric vehicles (BEV) and plug-in hybrid vehicles (PHEV) as percentages of total personal and rental fleet vehicle stocks. Number and location of EV charging infrastructure. Ethanol content of LDV fuels.
9. MODE SHIFT	2045: reduce VMT by 20%. Increase transit service hours by 2% each year, starting in 2026 until 2045. Add 10 miles of bike lane infrastructure to each urban center annually.	Mode split, total VMT, per capita VMT, transit ridership and service hours, increase total miles of bike lanes and sidewalks (today these are 157 miles and 153 miles respectively).
AIR TRANSPORTATION		
10. FUEL DECARBONIZATION	2026: Mandate airports to supply SAF, at minimum 5% of total fuel use. Increase SAF requirements 5% every 5 years. By 2045: 100% of jet fuel is sustainable aviation fuel (SAF).	Aviation fuel use by type, including SAF.
11. REDUCE FUEL CONSUMPTION IN AIR TRANSPORTATION	Mandate efficient ground travel airplane engine use (e.g., single engine taxiing, no idling) effective by the end of 2026 at all airfields. Continue to investigate viability of using electric sea gliders to replace inter-island flights.	Fuel consumption of aircrafts during idle time. Number of sea glider trips.

Action	Schedule	Metrics
AIR TRANSPORTATION		
12. AIRPORT GROUND TRANSPORTATION ELECTRIFICATION	2026: Develop an electrification plan and create a technical working group for cooperation and following the state of the art in electrifying airport ground transportation. 2035: All ground transportation is electrified.	Fuel use in and rate of electrification of airport ground operations vehicles.
MARINE TRANSPORTATION		
13. FUEL DECARBONIZATION	2026: Mandate that marina fuel sales contain at minimum 5% sustainable marine fuel (SMF). Increase SMF mix by 5% every 10 years or fewer. 2045: 100% of vessel fuel is SMF.	Vessel fuel use by type, including SMF.
14. ENERGY EFFICIENCY IN CRUISE SHIPS	2027: Mandate best practices in marine vessel fuel consumption in Hawai'i ports. 2045: cruise ship operations emit a maximum of 5 gCO ₂ e/MJ.	Cruise ship fuel consumption volumes. SMF use in cruise ships. Number of cruise ships docked.

Table 53: Transportation Sector Measures Implementation Schedule and Milestones.

9.9 Cost Estimates for Implementation

Rental Vehicle Electrification

The costs of fuel use were modeled for the regular rental vehicle market under which no EV uptake is anticipated, as well as for the rental vehicle market with full EV replacement by 2040. Projected costs include gasoline and electricity expenditures required to fuel the vehicles for the estimated VMT they travel, year-over-year. The table and figure below summarize the costs of vehicle operations for both scenarios, as well as the net costs/savings and cumulative costs/savings between 2026 and 2045.

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected costs	401	449	471	500	528	9,453
Costs with EV replacement	390	411	410	420	453	8,323
Difference (savings)	(11)	(38)	(60)	(79)	(75)	(1,130)
NPV (3%)						(786)

Table 54: Modeled costs and savings of gasoline and electricity use for the standard projection of the rental vehicle market versus a rental vehicle market in which all vehicles are replaced with electric models by 2040, in milestone years.

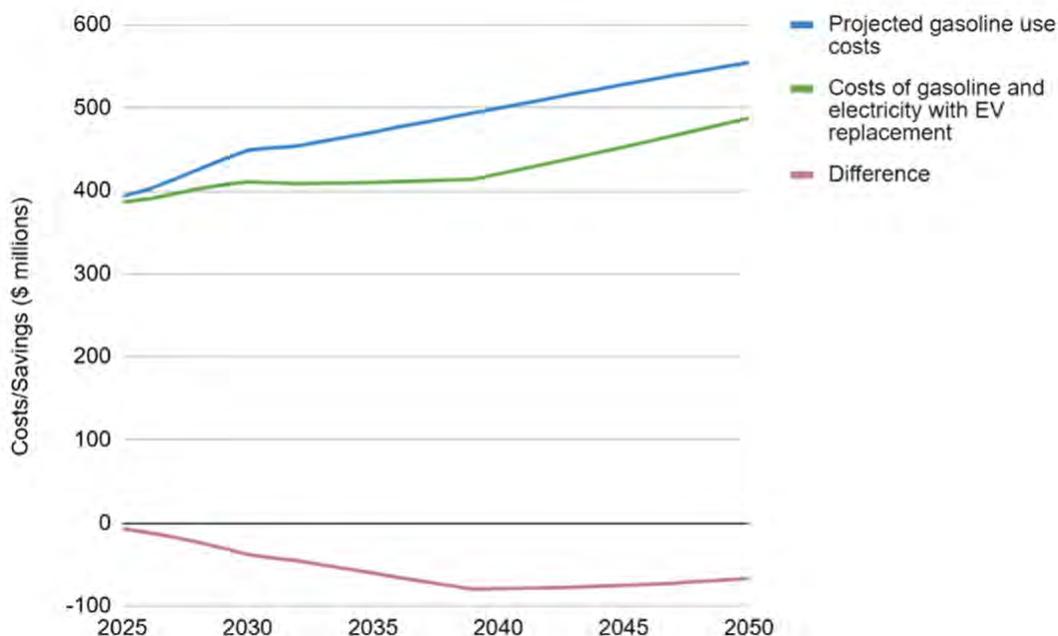


Figure 32: Modeled costs and savings of gasoline and electricity use for the standard projection of the rental vehicle market versus a rental vehicle market in which all vehicles are replaced with electric models by 2040.

Clean Fuels

The costs of fuel use were modeled for the regular use of gasoline in vehicles as well as for the accelerated EV uptake with 50% ethanol blend by 2045 scenario, as vehicles increasingly electrify. Projected costs include fuel expenditures. Gasoline costs are expected to rise until 2045 whereas ethanol costs are expected to rise until 2034 and decline after that. Ethanol costs a premium over the next decade but as production grows and gasoline prices rise, ethanol prices are expected to outcompete those of gasoline. The table and figure below summarize the costs of fuel use in vehicle operations for both scenarios, as well as the net costs/savings and cumulative costs/savings between 2026 and 2045.

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected gasoline use costs	629	628	536	429	294	10,102
Gasoline use costs with 25% ethanol blend	635	639	526	419	285	10,051
Difference (savings)	6	12	(9)	(10)	(9)	(51)
NPV (3%)						(18)

Table 55: Modeled fuel costs and savings of light-duty vehicle operation under projected standard gasoline use versus accelerated EV adoption and use of 50% ethanol blend by 2045.

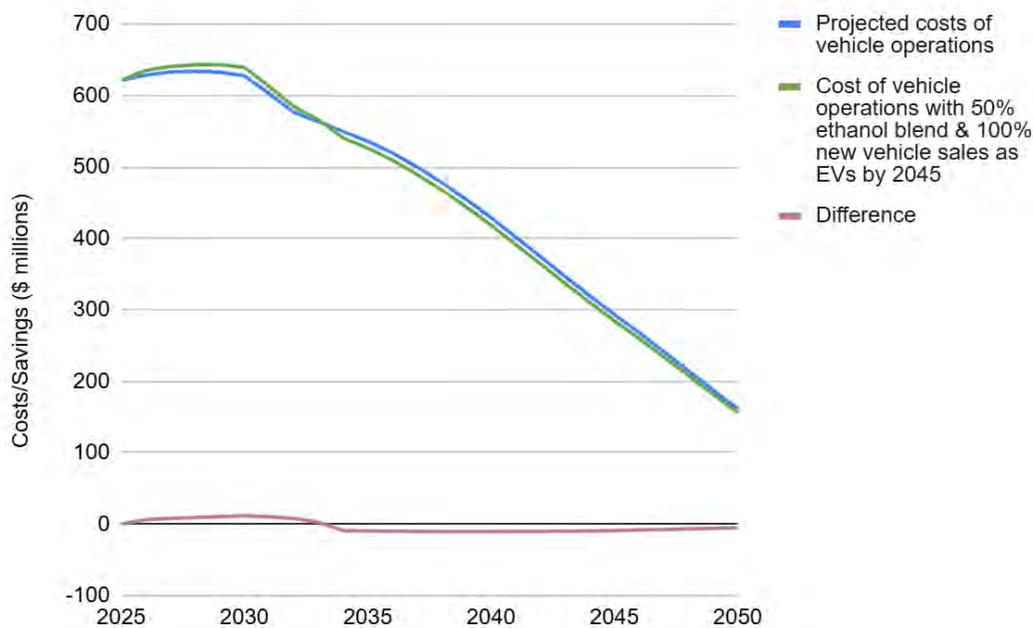


Figure 33: Modeled fuel costs and savings of light-duty vehicle operation under projected standard gasoline use versus accelerated EV adoption and use of 55% ethanol blend by 2045.

Mode Shift

The cost of gasoline use by personal vehicles between 2026 and 2045 was modeled and compared with the costs of gasoline under the 20% mode shift scenario. The following table and figure summarize the costs of gasoline use in both scenarios, as well as the net costs/savings and cumulative costs/savings between 2026 and 2045.

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Total projected gasoline use costs	629	628	536	429	294	10,102
Total projected gasoline use costs with mode shift	625	609	504	390	258	9,540
Difference (savings)	(4)	(19)	(32)	(39)	(35)	(562)
NPV (3%)						(392)

Table 56: Modeled fuel costs and savings of projected vehicle fuel use versus a scenario in which 20% of trips are shifted to transit and active transportation modes.

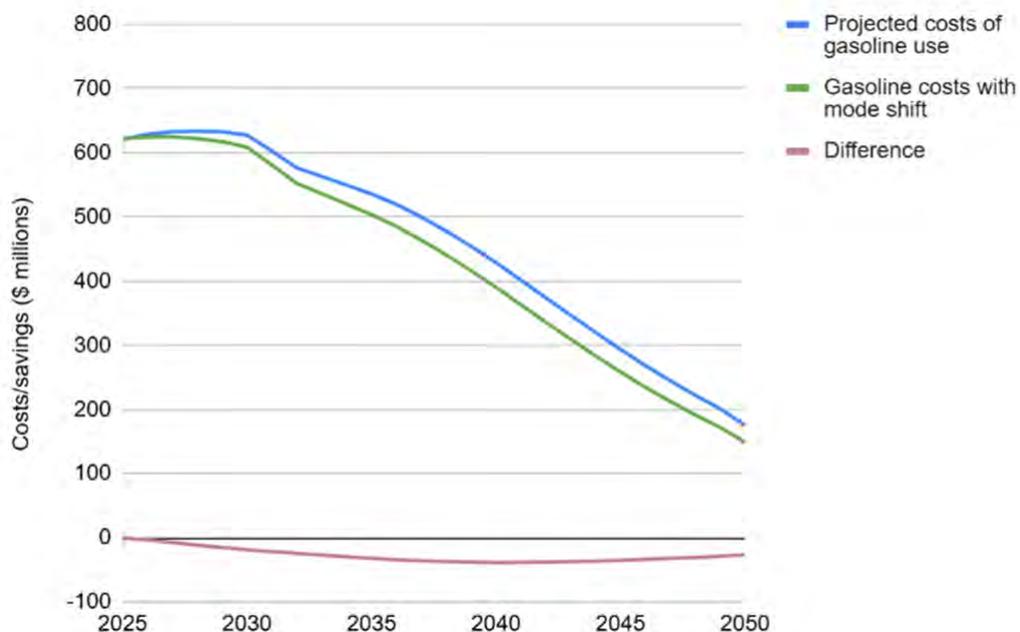


Figure 34: Modeled fuel costs and savings of projected vehicle fuel use versus a scenario in which 20% of trips are shifted to transit and active transportation modes.

Sustainable Airline Fuel Blend

The cost of projected jet fuel use was modeled and compared against the costs of using 100% SAF jet fuel blend by 2045. Jet fuel prices are assumed to remain consistent past 2030. SAF price parity isn't expected until the mid-2040s. Under these assumptions, SAF will continue to cost a premium for the foreseeable future, making its use more expensive than using standard jet fuel.

\$ billions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected jet fuel use costs	2.57	3.30	3.30	3.30	3.28	64.64
Costs of jet fuel use + 30% SAF blend by 2040	2.62	3.92	4.12	4.01	3.63	76.79
Difference (savings)	0.05	0.62	0.82	0.71	0.35	12.15
NPV (3%)						8.6

Table 57: Modeled fuel costs and savings of projected aviation fuel use versus a scenario in which 100% SAF blend is used in aviation fuels by 2045, for milestone years.

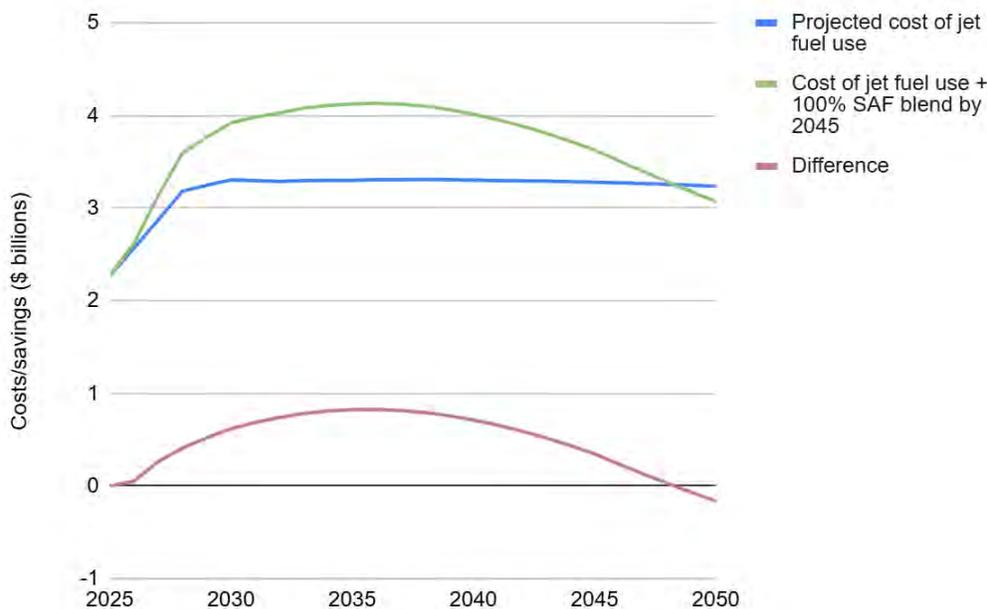


Figure 35: Modeled fuel costs and savings of projected aviation fuel use versus a scenario in which 100% SAF is used in aviation fuels by 2045.

Air Travel Electrification

The cost of jet fuel use in air travel was modeled between 2026 and 2045 and compared with fuel costs if 1% of flights were replaced with electricity-powered sea gliders. Due to their difficulty to predict, jet fuel and electricity costs are assumed to remain consistent post-2030 for simplicity. Electric sea gliders are expected to be cheaper to operate using electricity than airplanes using jet fuel. However, more trips and/or more sea gliders are required to move the same number of people, given their roughly 10 times smaller vessel size.

\$ billions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected costs of jet fuel use	2.568	3.304	3.392	3.445	3.486	66.5
Cost of jet fuel use + electricity use	2.568	3.302	3.388	3.439	3.480	66.6
Difference (savings)	0.000	0.002	0.004	0.006	0.006	(0.078)
NPV (3%)						(0.069)

Table 58: Modeled costs and savings of projected aviation fuel use versus a scenario in which 1% of flights are replaced by electrified aviation.

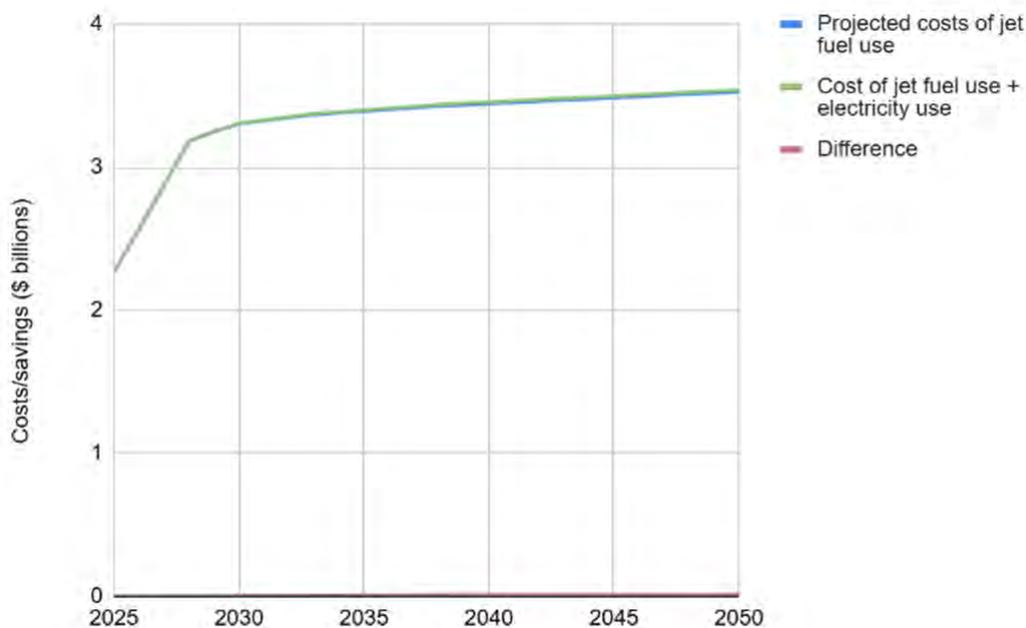


Figure 36: Modeled costs and savings of projected aviation fuel use versus a scenario in which 1% of flights are replaced by electrified aviation.

Marine Fuel Decarbonization

SMF costs a premium compared to standard marine fuel for the foreseeable future. Using it increases fuel costs slightly. The table and figure below summarize the costs associated with standard marine fuel use between 2026 and 2045 contrasted with the use of 100% SMF by 2045.

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected marine fuel costs	313	332	361	385	414	7,246
Costs with 100% SMF by 2045	317	354	408	460	521	8,281
Difference (savings)	4	22	47	75	108	1,034
NPV (3%)						691

Table 59: Modeled costs and savings of projected marine fuel use versus a scenario in which 25% of fuel is replaced with SMF.

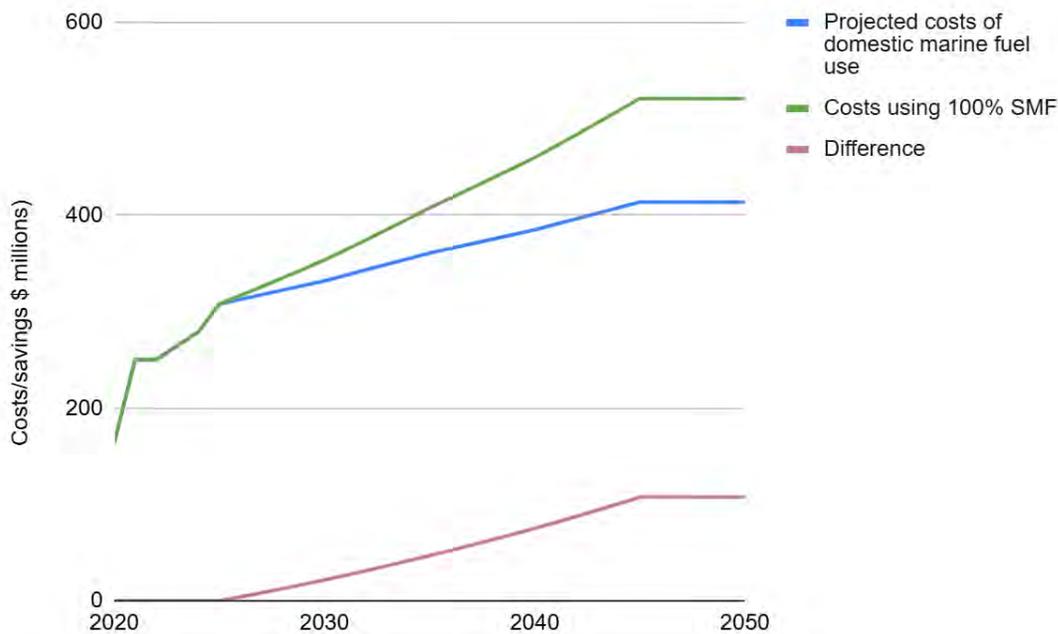


Figure 37: Modeled cost differences between projected marine fuel use versus a scenario in which 100% of fuel is replaced with SMF by 2045.

Cruise Ship Efficiency and Sustainable Fuels

The following table and figure summarize the fuel cost differences between the standard scenario and the scenario in which cruise ships achieve 5 gCO₂e/MJ for cruise ship operations by 2045. The costs represent those of switching to sustainable marine fuels.

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Projected costs of cruise ship fuel use	13.52	13.52	13.52	13.52	13.52	270.0
Costs of sustainable marine fuel use	13.38	13.25	13.11	12.98	12.84	305.4
Difference (savings)	(0.14)	(0.27)	(0.41)	(0.54)	(0.68)	(35.1)
NPV (3%)						(23.6)

Table 60: Modeled costs and savings of projected cruise ship fuel use versus a scenario in which cruise ships operate using sustainable marine fuel, in milestone years.

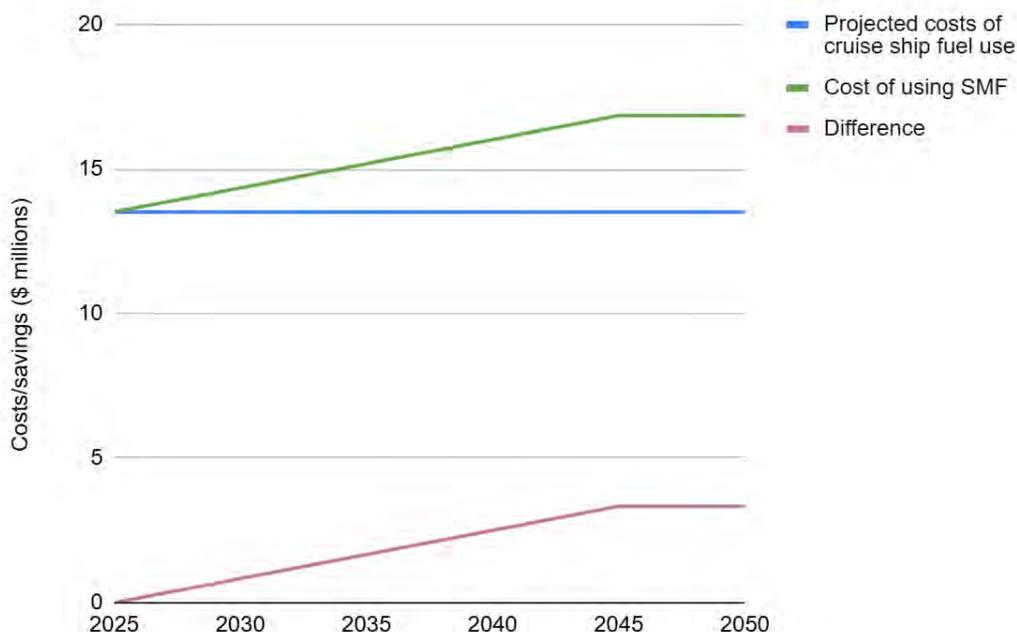


Figure 38: Modeled costs and savings of projected cruise ship fuel use versus a scenario in which cruise ships operate using sustainable marine fuel.

9.10 Funding Sources

Transportation- Ground, Air, and Marine

Changes in federal funding for ground transportation include the phasing out of tax rebates for electric vehicles and the infrastructure needed for them. Federal support for transitioning heavy duty vehicle to clean vehicles has stopped. The Active Transportation Infrastructure Investment Program supporting active transportation and multi modal transportation infrastructure has been cut. Efforts to transition air and marine transportation to clean energy have faced the same challenges with entire government programs shut down and funding mechanisms removed.

All-encompassing transportation government funding can be found at the Federal Transit Administration Grant Programs. The Federal Transit Administration (FTA) Grant Programs provide funding to support public transportation projects that reduce greenhouse gas emissions, improve transit efficiency, and advance climate-resilient infrastructure. Funding amounts vary by program, with discretionary grants often ranging from \$1 million to over \$50 million per project depending on scope and eligibility¹⁸⁷.

¹⁸⁷ Federal Transit Administration Grant Program, accessed December 5, 2025, <https://www.transit.dot.gov/funding/grants/grant-programs>

Ground:

Federal Funds

The Vehicle Technologies Office funds research, development, demonstration, and deployment of clean transportation technologies, including electric vehicles, efficient powertrains, battery innovations, and charging infrastructure, to reduce greenhouse gas emissions and lower transportation energy demand. In fiscal year 2025, VTO announced up to \$88 million in funding for advanced vehicle and mobility technology projects, with individual awards ranging from about \$1 million to \$6 million per project under its program-wide grant opportunity.¹⁸⁸

The Federal Transportation Alternatives Program (TAP) provides Hawai‘i funding to support walking, biking, safe-routes, trails, and other low-carbon transportation projects that reduce greenhouse gas emissions and enhance community resilience. The state receives a portion of the national TAP allocation, which totals roughly \$1.4 to \$1.5 billion annually, to invest in active-transportation and climate-beneficial infrastructure across Hawai‘i’s islands.

State Funds

The Hawaii State Energy Office’s Diesel Replacement Rebate (DRR) program helps reduce greenhouse-gas emissions by offering rebates of up to 45% toward the purchase of new electric or zero-emission replacements for medium- and heavy-duty diesel vehicles and related charging infrastructure. Currently, over \$7 million is available statewide through the program¹⁸⁹

The Hawai‘i State Energy Office is developing a “Transportation Electrification Loan Program” to support ground-transportation electrification in Hawai‘i, enabling clean-energy upgrades for vehicles and charging infrastructure. Under this program, eligible projects can receive financing through a revolving credit line of up to \$50 million to purchase or lease electric vehicles and associated charging infrastructure.¹⁹⁰

The Hawai‘i Energy EV and EV-Charging Equipment Incentives support climate-friendly transportation by offering rebates for electric vehicle charging infrastructure, specifically up to \$4,500 for new multi-port Level-2 chargers and up to \$35,000 for new DC fast chargers (with somewhat lower amounts for upgrades/retrofits). These incentives help reduce barriers to EV adoption in Hawai‘i by covering a substantial portion of installation costs for homes, multi-unit dwellings, businesses, or fleet operators.¹⁹¹

¹⁸⁸ Department of Energy Vehicle Technologies Office, accessed December 5, 2025, <https://www.energy.gov/eere/vehicles/funding-opportunities>

¹⁸⁹ Hawai‘i State Energy Office Diesel Replacement Rebate Program Application, accessed December 5, 2025, https://energy.Hawai‘i.gov/diesel-replacement/application_year_3/

¹⁹⁰ U.S. Department of Energy Transportation Electrification Loan Program, accessed December 5, 2025, <https://afdc.energy.gov/laws/all?state=HI#State%20Incentives>

¹⁹¹ Hawai‘i EV, Hawai‘i EV and EV Charging Equipment Incentives, accessed December 5, 2025, <https://Hawai‘iev.org/incentives>

The Hawai‘i Electric Bike and Moped Rebate Program helps reduce transportation-related emissions by offering rebates for new electric bicycles and electric mopeds used across Hawai‘i. Eligible purchases receive a rebate of either 20% of the retail price or \$500 (whichever is less).¹⁹²

Public-Private & Philanthropic Partnerships

Ulupono Initiative: As a key impact investor in Hawai‘i, Ulupono actively funds projects in local food production, renewable energy, and waste reduction. Their support can be leveraged to provide the “matching funds” often required for federal grants.¹⁹³

Air:

Federal Funds

The Airport and Airway Trust Fund (AATF) provides funding to support airport infrastructure, air traffic modernization, and environmental initiatives that reduce the climate impact of air transportation. The Airport Improvement Program allocates part of the roughly US\$3.3 billion distributed nationally each year to public-use airports in Hawai‘i for projects such as runway safety, lighting upgrades, noise mitigation, and other improvements that enhance efficiency and sustainability.¹⁹⁴

The federal Internal Revenue Service Sustainable Aviation Fuel Tax Credit provides a climate-change incentive for SAF producers. Eligible fuels receive \$1.25 per gallon, with an additional \$0.01 per gallon for each percentage point the fuel’s lifecycle greenhouse gas emissions exceed a 50 percent reduction compared with conventional jet fuel, up to a maximum of \$1.75 per gallon.¹⁹⁵

State Funds

The Hawai‘i Sustainable Aviation Fuel Program supports development and use of low-carbon jet fuel in Hawai‘i, aiming to reduce emissions from air travel by promoting production and adoption of sustainable aviation fuel (SAF). It was allocated \$5 million for fiscal year 2025–2026 (and the same amount for 2026–2027) to help build local SAF supply and provide incentives for intrastate flights complying with the SAF requirement.¹⁹⁶

Public-Private & Philanthropic Partnerships

Oneworld Alliance: The Oneworld Alliance, in partnership with Breakthrough Energy Ventures, recently launched a dedicated fund to accelerate development and scaling of next-generation

¹⁹² State of Hawai‘i Department of Transportation, Hawai‘i Electric Bike and Moped Rebate, accessed December 5, 2025, <https://hidot.Hawai‘i.gov/Hawai‘i-electric-bike-and-moped-rebate/>

¹⁹³ Ulupono Initiative Funding, accessed December 5, 2025, <https://ulupono.com/what-we-do/what-we-fund/>

¹⁹⁴ Federal Aviation Administration Airport and Airway Trust Fund, accessed December 5, 2025, [https://www.faa.gov/about/budget/aatf#:~:text=Established%20in%201970%2C%20the%20Airport,Fund%20\(AATF\)%20Fact%20Sheet.](https://www.faa.gov/about/budget/aatf#:~:text=Established%20in%201970%2C%20the%20Airport,Fund%20(AATF)%20Fact%20Sheet.)

¹⁹⁵ U.S. Internal Revenue Service Sustainable Aviation Fuel Tax Credit, accessed December 5, 2025, [https://www.irs.gov/credits-deductions/businesses/sustainable-aviation-fuel-credit#:~:text=The%20credit%20is%20\\$1.25%20for,exceeds%2050%25%20up%20to%20\\$0.50.](https://www.irs.gov/credits-deductions/businesses/sustainable-aviation-fuel-credit#:~:text=The%20credit%20is%20$1.25%20for,exceeds%2050%25%20up%20to%20$0.50.)

¹⁹⁶ State of Hawai‘i Sustainable Aviation Fuel Program, accessed December 5, 2025, https://capitolwebsite.azurewebsites.net/hrscurrent/Vol04_Ch0201-0257/HRS0206M/HRS_0206M-0024.htm#:~:text=%C2%A7206M%2D24%20Sustainable%20aviation,support%20equipment%20fuel%20efficiency,%20or

sustainable aviation fuel technologies. The fund carries an initial investment of approximately \$150 million and aims to reduce emissions in air travel by supporting lower-carbon jet fuel alternatives for member airlines.¹⁹⁷

Marine:

Federal Funds

The United States Marine Highway Program (USMHP) funds marine-transport projects that shift freight from land to water, reducing road congestion and lowering greenhouse-gas emissions. For FY 2025, about \$14,042,621 is available nationwide for eligible projects, with grants supporting the development and expansion of marine-highway routes and services.¹⁹⁸

The Maritime Environmental and Technical Assistance Program (META) supports research, demonstration, and deployment of clean marine technologies and practices, including emissions reduction, alternative fuels, and port electrification, to reduce environmental impacts from shipping and ports. Current funding for META is about \$6 to 8.5 million per year, with a portion directed toward projects focused on decarbonizing maritime transportation and improving marine environmental sustainability.¹⁹⁹

State Funds

The Aloha i ke Kai Ocean Stewardship Fee Program collects a \$1 fee per passenger from commercial ocean tours and water-recreation operators, generating an estimated \$1–5 million annually. Funds support sustainable marine transportation in Hawai‘i by promoting low-emission vessel operations, installing mooring buoys to prevent environmental damage, and advancing sustainable practices that reduce the carbon and ecological footprint of marine travel.²⁰⁰

Public-Private & Philanthropic Partnerships

Bonnell Cove Foundation: The Bonnell Cove Foundation awards grants (generally up to \$10,000) to nonprofits working on marine-environment protection, boating safety, and green boating projects that reduce the environmental impact of small-craft operations.²⁰¹

¹⁹⁷ Oneworld Alliance Breakthrough Energy Ventures investment fund to advance and commercialize Sustainable Aviation Fuel Technologies, accessed December 5, 2025, <https://www.oneworld.com/news/oneworld-alliance-airlines-and-breakthrough-energy-ventures-launch>

¹⁹⁸ U.S. Department of Transportation Maritime Administration Marine Highway Grant Program, accessed December 5, 2025, <https://www.maritime.dot.gov/grants/marine-highways/marine-highway>

¹⁹⁹ U.S. Department of Transportation Maritime Administration Maritime Environmental and Technical Assistance Program, accessed December 5, 2025, <https://www.maritime.dot.gov/innovation/meta/maritime-environmental-and-technical-assistance-meta-program>

²⁰⁰ State of Hawaii Division of Aquatic Resources, Aloha i Ke Kai Hawai‘i Ocean Stewardship Fee Program, accessed December 5, 2025, https://dlnr.hawaii.gov/alohaikakai/files/2025/04/OSUF-Brochure_17-3.pdf

²⁰¹ Bonnell Cover Foundation Grants, accessed December 5, 2025, <https://www.bonnellcove.org/apply>



10. Agriculture, Forestry and Other Land Uses (Sources and Sinks)

MEASURES

17. AGRICULTURAL SOIL AMENDMENT

**18. NATURE-BASED MITIGATION SOLUTIONS
(FORESTS AND WETLANDS)**

19. NATURE-BASED RESILIENCE SOLUTIONS

10. Agriculture Forestry and Other Land Uses (Sources and Sinks)

10.1 Overview: Transforming AFOLU for Regenerative Impact

Hawai‘i’s Agriculture, Forestry, and Other Land Use (AFOLU) sector is vital to the State. The only sector that removes carbon from the atmosphere AFOLU holds notable potential to mitigate climate change through carbon sequestration while strengthening local food systems, community resilience, and environmental stewardship. This strategy advances a vision rooted in *aloha ‘āina* (love for the land), circularity, and security, where waste becomes nutrient, degraded lands are healed, water and food are plentiful and the economy thrives by honoring ecological boundaries. This chapter outlines integrated measures, actions and commitments focused on soil health, nutrient cycling, ecosystem restoration, fire prevention, biosecurity, and capacity-building, all of which can contribute to carbon capture and resilience, improving equity, and securing long-term prosperity and wellbeing for the people and lands of Hawai‘i.

Hawai‘i has identified over 60 land management projects totaling more than \$448 million in agricultural and ecosystem restoration needs across the islands. These efforts include multi-use initiatives such as integrating food production into solar farms and restoring watershed functions to support healthy forests, streams, and coral reefs. With a clear focus on the connection between land and sea, many projects prioritize native plant restoration, regenerative agriculture, and increasing local food production to reduce dependence on imports as climate impacts intensify. Together, these investments demonstrate that Hawai‘i has a well-defined portfolio of projects that strengthen both food security and environmental resilience.

To achieve these overarching goals and innovative defining activities for the AFOLU sector in Hawai‘i, a regenerative and just transition values frame is vitally important and appropriate within a Hawaiian context. Regenerative agriculture through soil health infrastructure, diverse ecological and Indigenous Traditional Ecological Knowledge (ITEK) guidance for best practices for the islands is increasingly featured and valued, deserving a deeper commitment.

Regenerative agriculture, including agroforestry and the application of local and Indigenous Hawaiian TEK for stewardship of ecosystems through hybridized adaptive traditional practices, strongly supports improvement of soil health, carbon sequestration, localized food systems and recovery of ecosystems, all of which translate to increased climate resilience. Agroforestry, silvopasture, organic and regenerative land management strategies such as increased ground cover, wind breaks, and crop rotation, are finding support through a suite of County and State programs on state-owned, community and private land management initiatives.

With a residential population of over 1.4 million and at least 10 million annual visitors, Hawai‘i has one of the most food importation-dependent populations in the world. Importing over 90% of our food and fertilizer, the Hawaiian Islands are uniquely vulnerable to statewide and community food insecurity in the face of anthropogenic climate change, fuel price fluctuations and other

economic or natural disturbances.^{202 203 204 205} Given 41% of Hawai‘i’s agricultural lands are currently unfarmed,²⁰⁶ there is an important opportunity to increase food security. Implementing TEK, regenerative and climate smart practices will also mitigate climate change and protect and recovering native ecosystems while reducing the food import rates.

Key to carbon drawdown is the protection of existing native forests. Protecting forest watersheds is the most cost effective and efficient way to replenish our aquifers and reduce impacts from climate change by absorbing GHGs and reducing flooding, erosion, and siltation of reefs and fisheries. Hawai‘i’s forested areas are the primary carbon sink in the state contributing the majority of assessed 2.5 MMT CO₂ Eq sequestered in 2022. Healthy native forests are essential to stabilizing soil organic carbon which accounts for over half of the carbon stored in Hawai‘i’s terrestrial ecosystems (approximately 158.9 Tg C of the total 232.9 Tg C where one Tg = 1 billion kilograms).²⁰⁷ Healthy soils act as living carbon reservoirs, offering not only climate benefits but also enhancing biodiversity, water retention, and productivity. Additionally, forests sustain irreplaceable cultural and natural values and facilitate social and cultural connections to *place*. Forests and agroforests are an essential part of the solution to tackle climate change and native biodiversity collapse.

In conjunction with protecting existing forests the restoration of historically forested areas and the revitalization of Hawai‘i’s soils are also important actions. As native forests are restored, additional CO₂ is removed from the atmosphere by the growth of new trees. These projects can also provide additional ecological, social, and economic benefits during the project lifetime. Restoring and creating novel Healthy forests and agroforests provide jobs and sustainable livelihoods through forest products, conservation, and restoration.

A note for defining and distinguishing terms: according to the IPCC glossary²⁰⁸, 1) *carbon stock* is “the quantity of carbon in a carbon pool” or reservoir (2019), the carbon pool being a system that can accumulate or release carbon (e.g., forests, soils, oceans) at a given moment; 2) *carbon store* is often used more loosely as a synonym for a carbon *pool* or *reservoir*. Many practitioners use *store* to mean a location or medium in which carbon is held (e.g., the forest biomass or soil); 3) *carbon sequestration* is defined by the IPCC (2019) as the “process of storing carbon in a carbon pool” and in land management terms, *sequestration* is explicitly defined as a process to increase

²⁰² "Increased Food Security And Food Self Sufficiency Strategy" (2012), https://files.hawaii.gov/dbedt/op/spb/INCREASED_FOOD_SECURITY_AND_FOOD_SELF_SUFFICIENCY_STRATEGY.pdf.

²⁰³ Leung, PingSun & Loke, Matthew. (2008). Economic Impacts of Improving Hawaii's Food Self-sufficiency. [Economic Impacts of Improving Hawaii's Food Self-sufficiency](#)

²⁰⁴ Suryanata, Krisnawati. "Diversified Agriculture, Land Use, And Agrofood Networks In Hawaii". *Economic Geography*, vol 78, no. 1, 2009, pp. 71-86. [Diversified Agriculture, Land Use, and Agrofood Networks in Hawaii* - Suryanata - 2002 - Economic Geography - Wiley Online Library](#)

²⁰⁵ Kent, George. "Food Security In Hawai‘i" (2016), <http://www2.hawaii.edu/~kent/FOODSECURITYINHAWAII.pdf>.

²⁰⁶ Melrose, Jeffrey et al. "Statewide Agricultural Land Use Baseline 2015" (2015), <http://hdoa.hawaii.gov/wp-content/uploads/2016/02/StateAgLandUseBaseline2015.pdf>.

²⁰⁷ Hawai‘i Greenhouse Gas Emissions Report for 2022 (2025)

²⁰⁸ IPCC Glossary, 2019 https://www.ipcc.ch/site/assets/uploads/2019/11/11_Annex-I-Glossary.pdf

“the carbon content of a carbon pool other than the atmosphere”; 4) *carbon sink* is defined as any “process or mechanism which removes a greenhouse gas ... from the atmosphere.”²⁰⁹

10.2 Key Features

Watershed Protection

Forests represent Hawai‘i’s primary carbon stock, therefore watershed and existing forest protection programs that maintain healthy resilient forest systems must be prioritized. Resilient forest systems must include those with diverse age classes, healthy regeneration and a mix of species. Biosecurity, the prevention of the establishment of invasive species, ungulate and invasive species control, and pathogen management programs must aggressively deal with these threats to forests, and strategies must be further developed to gradually²¹⁰ remove invasive species while simultaneously integrating and recovering native and canoe plant forests. It is acknowledged and understood that in the short term, depending upon techniques used, invasive species removal may cause a temporary drop in carbon storage however, healthy native forests provide many additional co-benefits such as flood protection, freshwater collection and providing habitat for important native species. The most cost effective way for the State to maintain and increase carbon sinks is protecting existing forests programs such as the Watershed Partnerships Program, the Legacy Land Conservation Program, The Forest Stewardship program and the Carbon Smart Land Manager Assistance Pilot Program²¹¹ support strategies which increase climate resilience through healthy local ecosystem recovery and protection.

Wildfire

Climate change is amplifying wildfire threats across Hawai‘i, particularly in areas of unmanaged lands where fire-promoting invasive grasses and shrubs have grown. A proactive AFOLU fire resilience strategy is essential. This includes invasive species prevention and removal, particularly fire-prone species, and applying spacing typology and maintenance fire risk management methodologies for a replanting process of native and other appropriate plant species. A useful resource is the Hawai‘i Pacific Weed Risk Assessment²¹² (or Fire Weed Risk Assessment). It also involves restoring ecosystems to conditions that retain more moisture and reduce soil and water runoff. Programs are needed to move abandoned agricultural lands back into climate-adaptive agricultural or ecosystem restoration active management

Biosecurity

The Hawai‘i Interagency Biosecurity Plan (HIBP) (2017–2027) is a comprehensive, cross-agency strategy with 147 actions designed to strengthen Hawai‘i’s biosecurity system by addressing gaps

²⁰⁹ IPCC Glossary (2019). https://www.ipcc.ch/site/assets/uploads/2019/11/11_Annex-I-Glossary.pdf

²¹⁰ A graduated cyclical and stage-based approach to invasive species removal, fencing and endemic / food forest regenerative replanting has been shown to reduce the transitional risks, including erosion and soil depletion, and mitigate the loss of carbon stock while shifting towards a more resilient and healthy biodiversity.

²¹¹ Carbon Smart Land Management Assistance Pilot Program CSLMAPP (DLNR, 2025)

<https://governor.hawaii.gov/newsroom/dlnr-news-release-land-managers-receive-funds-to-support-climate-change-resilience-february-13-2025/>

²¹² Plant Pono Hawai‘i Fire Weed Risk Assessment <https://sites.google.com/site/weedriskassessment/home>

in pre-border, border, and post-border controls against invasive species.²¹³ It provides a roadmap to better protect Hawai‘i’s agriculture, environment, public health, and economy by improving inspection capacity, risk assessment, inter-agency coordination, and rapid response, supporting stronger comprehensive efforts to sink and sequester carbon, and preventing (or at least mitigating) the invasive species threat to ecosystems and climate change mitigation activities.

Urban Forestry

Trees are a critical component of cities. Healthy trees can lessen impacts associated with the built environment by reducing stormwater runoff, energy consumption, and air pollutants. The ‘*City of Honolulu, Hawai‘i Municipal Forest Resource Analysis*’²¹⁴ found that annual benefits of urban trees in Honolulu total \$3.9 million and average \$90 per tree. The findings also showed a 3:1 return on investment for urban trees. Their value increases exponentially over time, outpacing the cost to maintain, contributing to energy savings, run-off prevention, disaster risk mitigation, reducing urban pollution, and more.²¹⁵ Urban forest initiatives are essential in keeping urban areas cooler, supporting flood control and sequestering carbon. The State’s Tree Canopy Viewer²¹⁶ is a visualization tool that overlays tree canopy with equity maps and disproportionate eco-social risks that urban tree cover may help ameliorate. A distributional equity lens must prioritize tree planting in communities which systematically and disproportionately have lost green spaces. An increase in tree canopy within low-income and most-climate vulnerable communities can reduce heat-related illness and mortality in at-risk populations. The up-front maintenance cost of city-planted trees, limited incorporation of landscaping in urban planning, and challenges in staffing recruitment has hampered efforts to increase urban forestry goals.

Food System Equity and Localized Agricultural Support

A regenerative food system must be inclusive, accessible, and rooted in local production. Increasing food sovereignty combined with circular systems such as composting simultaneously supports carbon sequestration by shortening supply chains and revitalizing working lands. Community equity and access feedback highlights the need to reconsider land use permission parameters, to enable land use for agriculture and tree growth outside of designated agricultural plots/zones. There is a need to support more community accessed and managed farm plants and native nurseries, and to facilitate spaces where community-led initiatives, particularly those informed by Indigenous traditional ecological practices and other complimentary ecocultural knowledge, may have space and resource support to flourish, both inland, in lo‘i kalo wetlands and watershed management practices, and along coastal areas for aquaculture systems recovery

²¹³ *The Hawai‘i Interagency Biosecurity Plan*, DLNR (2018); <https://dlnr.hawaii.gov/hisc/files/2018/12/HIBP-Report-July-2018-Executive-Summary.pdf>

²¹⁴ City Of Honolulu, Hawai‘i Municipal Forest Resource Analysis, Vargas et al (2007). https://www.honolulu.gov/tod/wp-content/uploads/sites/73/2025/02/Municipal_Forest_Resource_Analysis.pdf Vargas, K. E., McPherson, E. G., Simpson, J. R., Peper, P. J., Gardner, S. L., Xiao, Q. I. N. G. F. U., & OKA, S. (2007). City of Honolulu, Hawaii, municipal forest resource analysis. *Center for Urban Forest Research USDA Forest Service*.

²¹⁶ Department of Land and Natural Resources, Division of Forestry and Wildlife. *Tree Canopy Viewer*. <https://usfs.maps.arcgis.com/apps/webappviewer/index.html?id=d1bb42e8e14c46528bbcedced6b03e62>

(traditional fishponds, or Loko Iʻa, which increase local food production through fisheries, endemic limu²¹⁷ and other foods).

To ensure food equity and carbon alignment measures, it is essential to deepen and continue partnerships with state and federal agencies to expand programs such as “Da Bux” which support low-income access to healthy local and organic foods,²¹⁸ and the ‘Āina Pono/Farm-to-School Initiative. Unique programs like “Da Bux” are linked into the federally funded Supplemental Nutrition Assistance Program (SNAP) to make healthy local foods accessible to marginalized and most-vulnerable populations. Thirty-two percent of Hawaiʻi households, or approximately 463,000 households, were food insecure in 2024-2025²¹⁹; 11% of these households experience low food security, and 21% experience very low food security - skipping meals or going days without food because they could not afford it.

Localized agriculture struggles in part due to the high operating costs for farmers, the low wages offered to farm labor due to these high operating costs, and the low profitability margins for small and medium farmers in Hawaiʻi. Without subsidies and other fund-gap support for local farmers, the agricultural industry will continue to struggle to bring more farmers into the local food system economy.

Wetlands and Loko iʻa (Traditional Hawaiian Fishpond Aquaculture)

The State of Hawaiʻi, primarily through the Department of Land and Natural Resources (DLNR), supports the restoration and management of traditional Hawaiian fishponds (loko iʻa) by providing streamlined permitting, technical guidance, and community-based management support. The Hoʻāla Loko Iʻa program simplifies state and federal permitting requirements, allowing for repair, maintenance, and ecological restoration while recognizing traditional practices and cultural values. In addition, the state facilitates capacity-building for practitioners, supports monitoring and resilience planning, and collaborates with research institutions to integrate ecological adaptation and climate resilience into fishpond management. Legislative and programmatic initiatives also aim to inventory loko iʻa across public and private lands to enhance long-term stewardship and ecological sustainability.

Ocean Acidification

Ocean acidification, a direct result of the carbon dioxide (CO₂) humans release into the atmosphere.²²⁰ When carbon dioxide dissolves in seawater, it triggers a series of chemical reactions that lower the pH of the water, making it more acidic. This shift in ocean chemistry has serious consequences for marine life, especially for organisms that rely on calcium carbonate to form their shells and skeletons, such as corals, oysters, clams, and certain plankton. As the ocean becomes more acidic, it becomes harder for corals to grow and maintain their structures. Over time, coral

²¹⁷ limu in Hawaiian is a water plant, encompassing more than 70 various edible seaweeds. [Hawaiian Dictionaries](#) (1986)

²¹⁸ Da Bux: Double Up Food Bux *Making Hawaiʻi grown fruits and vegetables more affordable for SNAP-EBT cardholders.* <https://dabux.org/>

²¹⁹ *Food Insecurity in Hawaii 2024-2025* Hawaii Foodbank (2025) [Food Insecurity Persists in Hawaiʻi - Hawaiʻi Foodbank](#)

²²⁰ National Oceanic and Atmospheric Administration. Ocean Acidification. <https://www.noaa.gov/education/resource-collections/ocean-coasts/ocean-acidification>

reefs can begin to die and crumble, drastically altering the underwater environment. This loss of coral habitat has a ripple effect on reef fish and other marine species that depend on coral reefs for shelter, food, and breeding grounds. Fewer fish means less biodiversity and a reduced food supply for coastal communities. But the impact doesn't stop beneath the waves. Coral reefs act as natural barriers, absorbing the energy of waves and storms. When reefs weaken or disappear due to acidification, coastal regions become more vulnerable to erosion, property damage, and flooding. This increases the risk to homes, infrastructure, and the lives of people living near the shore. To address this, the state developed an Ocean Acidification Action Plan outlining goals from 2021–2031. The emphasizes building resilience in coastal communities and ecosystems, promoting adaptive management, and improving public understanding through education and engagement. In 2018, Hawai'i joined the International Alliance to Combat Ocean Acidification, reinforcing its commitment to international collaboration and local action inspired by global strategies.

Regulatory and Policy Environment

The State regulatory and policy commitments in the State strive to protect and restore native ecosystems and promote local agriculture. Climate mitigation has recently been enacted to support to local land managers for carbon sequestration through local food and ecosystems regeneration.

ACT 151²²¹, SHL 2019—A Bill for an Act Relating to Agriculture, mandates that the Hawaii Department of Agriculture create a strategic plan to double food production and increase food exports by the state by 2030. Key provisions include requiring the DOA develop a strategic plan to increase areas of agricultural production, livestock, development of value-added products and improve infrastructure.

ADC (Chapter 163D, HRS): Agribusiness Development Corporation (ADC) statute — promoting local agriculture (Chapter 163D, HRS) to support the production of local agricultural products for local consumption ... reduce the State's reliance on imported agricultural products, and increase access to farmland and related infrastructure for small local farmers and cooperatives.

ACT 236 (2025) — formerly HB 427: Grants DABS authority to declare a biosecurity emergency (e.g., for invasive species outbreaks or pest threats) with gubernatorial approval — giving legal mechanisms for rapid action. Provides for creation of transitional-facility regulations: items entering Hawai'i by port/airport must be assessed and certified by trained biosecurity compliance auditors — strengthening inspection and quarantine protocols for pests, pathogens, and invasive species.

ACT 237 (2025) — formerly HB 774. This law establishes a Food and Product Innovation Network (within ADC) aimed at supporting small businesses and entrepreneurs: giving them access to facilities, equipment, technical expertise, certification and value-added processing resources, and aiding them to brand and market as “Hawai'i made / Produced in Hawaii / Processed in Hawaii.” This helps small-scale producers process, package, and market their products — an important step to scale up local food production beyond raw agriculture

²²¹ ACT 151 S.B. NO. 375 A Bill for an Act Relating to Agriculture. Legislature of the State of Hawaii (2019) [SLH2019_Act151.pdf](#)

HRS § 163D-15.6 (2024): Lease-preservation & land-use mandates. ADC in coordination with DAB must work to obtain agricultural leases of 20+ years (or up to 55 years in certain cases) in specified districts (leeward/central O‘ahu) and must refuse to allow non-agricultural conversion of those leased lands.

HRS § 171-3, DLNR shall manage, administer, and exercise control over public lands, the water resources, ocean waters, navigable streams, coastal areas ... state parks ... forests, forest reserves ... wildlife ... aquatic life ... natural area reserves, and other functions assigned by law. This statutory mandate gives DLNR broad responsibility for state lands, forests, coastal zones, water resources, etc. — the natural resources which are potentially central to climate change adaptation/resilience and carbon-sequestration strategies.

HRS Title 13, Chapter 225P: the statutory framework for climate action at the state level.

HRS § 225P-3 establishes the Hawaii Climate Change Mitigation and Adaptation Commission (CCMAC), “placed within” DLNR “for administrative purposes only.” This law directs CCMAC (under DLNR’s administrative umbrella) to coordinate state-level climate mitigation and adaptation efforts.

ACT 15 (2018) (as part of Chapter 225P amendments): Creates the Greenhouse Gas Sequestration Task Force under the state’s planning office (now OPSD), to align state clean-energy and carbon-sequestration initiatives, and requires coordination with the overarching climate-adaptation/mitigation commission — administratively embedded with DLNR.

HRS § 225P-5 establishes a statewide goal: to sequester more atmospheric carbon and greenhouse gases than emitted within the State as quickly as practicable, but no later than 2045. DLNR—and other state agencies—must account for both emissions reductions and carbon sinks (natural sequestration) when making land-use, conservation, development, and resource-management decisions.

HB1992 HD3 SD1 CD1 (Act 131) (2022) to allow composting in agricultural districts by designating it as a permissible land use. The Act also establishes and funds new staff capacity to help eliminate permitting barriers for small-scale compost operations. The purpose of the Act is to encourage the production of local compost and the diversion of certain materials from the State’s waste streams.

ACT 185 / Section 171-6 Hawai‘i Revised Statutes: established the Hawai‘i Carbon Smart Land Management Assistance Pilot Program. This pilot program, within the Department of Land and Natural Resources, incentivizes carbon sequestration activities on farms and forests through compensation contracts for eligible practices. The program aims to promote keeping forests and farmlands intact and sequestering additional carbon on these lands, through practices anticipated to improve soil health and carbon storage.

ACT 197--RELATING TO SPECIAL PURPOSE REVENUE BONDS TO ASSIST THE HAWAIIAN LEGACY REFORESTATION INITIATIVE TO RESTORE HAWAII’S FORESTS AND NATURAL RESOURCES. Authorizes the Department of Budget and Finance to issue

special purpose revenue bonds to assist Hawaiian Legacy Reforestation Initiative, LLC, in its mission to proliferate a sustainable model of endemic reforestation, ecosystem revitalization, endangered species recovery, and carbon credit sequestering.

ACT 238 --RELATING TO CLIMATE MITIGATION. Establishes a goal for the statewide greenhouse gas emissions limit to be at least fifty per cent below 2005 levels by 2030. Requires the Hawai'i state energy office to conduct a study to determine Hawai'i's pathway to decarbonization and identify challenges, opportunities, and actions that will be needed to achieve those goals. Appropriates funds out of the energy security special fund for the study.

ACT 302-RELATING TO COMPOSTING. Establishes and appropriates funds for a compost reimbursement program within the Department of Agriculture and for one full-time permanent compost reimbursement program manager position. Requires an annual progress report to the Legislature prior to each regular session.

ACT 175 --RELATING TO THE FARM TO SCHOOL PROGRAM Moves the Hawai'i farm to school program from the Department of Agriculture to the Department of Education. Establishes a programmatic goal for the Department of Education that at least 30% of food served in public schools shall consist of locally sourced products by 2030. Creates an annual reporting requirement.

ACT 151 - RELATING TO AGRICULTURE Requires the Department of Agriculture, in cooperation with the Office of the Governor, to develop a strategic plan to double local food production and increase food exports by 2030. Requires the Department of Agriculture to submit the strategic plan to the Legislature. Appropriates funds.

ACT 181 - RELATING TO JOB CORPS PROGRAM Allows the governor to designate the Department of Land and Natural Resources to administer or enter into agreements for the administration of a green job youth corps program that provides temporary work and training opportunities to help address the unemployment impacts of the COVID-19 pandemic and support economic diversification. Requires a report to the legislature. Appropriates American Rescue Plan Act funds.

HRS § 27-8 (2024) requires state agencies that purchase food — including the Hawaii Department of Education (DOE), health facilities, prisons, corrections, defense, and the University of Hawai'i system — to ensure a certain percentage of their food purchases come from “fresh local agricultural products” or “local value-added, processed agricultural or food products.” The mandate sets a schedule of increasing targets for local procurement: 10% by Jan 1, 2025; 18% by 2030; 26% by 2035; 34% by 2040; 42% by 2045; and 50% by 2050. Earlier legislation — Act 175 (2021) — mandated that DOE source at least 30% of food served in public schools from local sources by 2030.

10.3 Numbers and Targets: Current Status and Future Goals

The *Hawai‘i Greenhouse Gas Emissions Report for 2022* listed total emissions from the AFOLU sector at 1.11 MMT CO₂ Eq., accounting for 5.5 percent of total Hawai‘i emissions.²²² Carbon removals by sinks were 2.48 MMT CO₂ Eq. in 2022 and accounted for 100% of Hawai‘i carbon sinks. Even with the emission the AFOLU sector accounts for 1.37 MMT CO₂ Eq. of carbon sinks in 2022. Forest carbon accounted for the largest carbon sink, followed by urban trees, and landfilled yard trimmings and food scraps. Relative to 1990, emissions from AFOLU sources in 2022 were lower by roughly 24 percent. In contrast to 1990 levels, carbon removals from AFOLU sinks decreased in 2022 by roughly 3.6 percent. It is vital that Hawai‘i continue to protect watershed forests to not only maintain but increase carbon sinks for the state.²²³

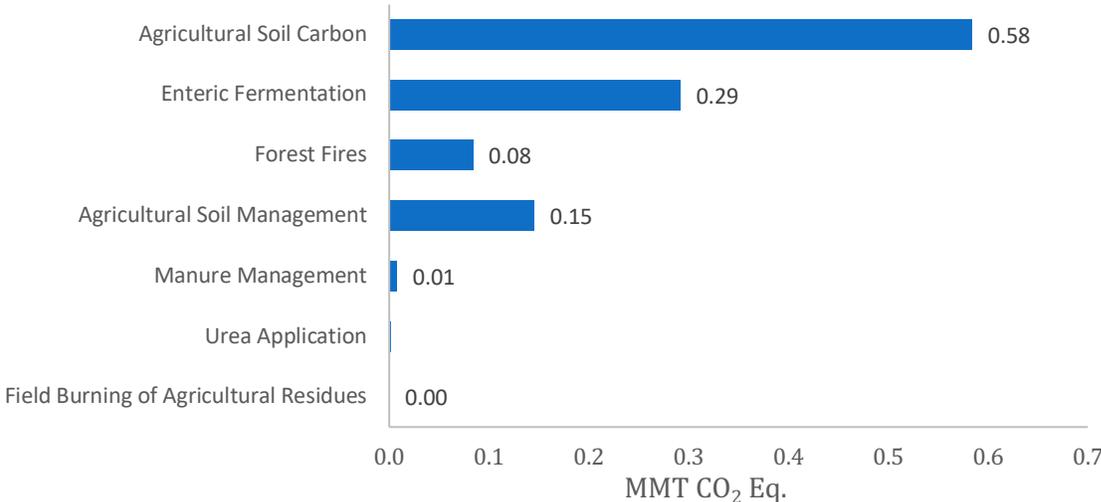


Figure 39: 2022 AFOLU Emissions by Source Excluding Sinks (MMT CO₂ Eq.)²²⁴

²²² Hawai‘i Department of Health. (2025, April). *Hawai‘i Greenhouse Gas Emissions Report for 2022*. <https://health.hawaii.gov/cab/files/2025/04/Final-2022-GHG-Emissions-Report.pdf>

²²³ Ibid.

²²⁴ Ibid.

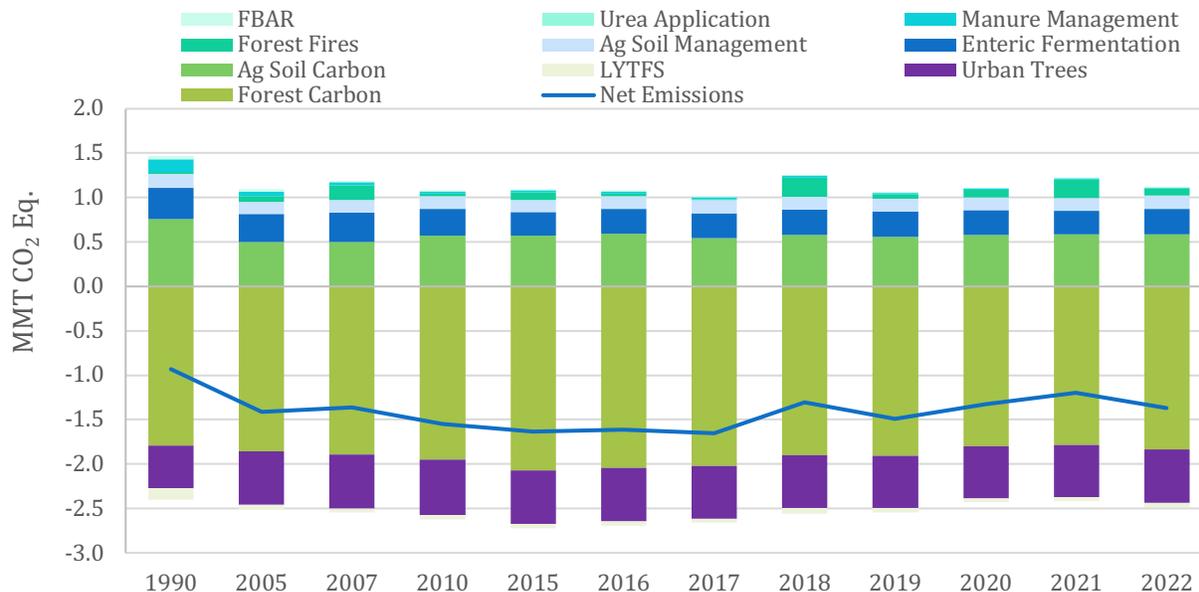


Figure 40: AFOLU Emissions and Removals by Source and Sink Category and Year (MMT CO₂ Eq.)²²⁵

While at present there are no explicitly State-mandated targets, there *are* goals and commitments to which State and County departments seek to adhere to, such as 30X30 Watershed Initiative²²⁶ to protect 30% of Hawai‘i’s priority watershed forests by the year 2030, and the State’s pledge to the international One Trillion Trees (1TT) initiative²²⁷ to protect, conserve, and restore 100,000,000 trees by 2030. DLNR’s 30x30 watershed initiative has successfully protected 22% of watersheds and is on the path to meet the goal for protecting 843,000 acres.²²⁸

10.4 Challenges and Innovations

The challenges and opportunities for AFOLU in Hawai‘i tend to be deeply interconnected, with many solutions embedded in the difficulties faced.

Reliance upon food imports creates deep climate disruption vulnerability and an opportunity to grow traditional nature-based and localized land management practices which would support local food security alongside creating carbon sequestration and adaptive resilience for our island communities.

²²⁵ Ibid.

²²⁶ 30x30 Watershed Initiative: Natural Resource Management 02 Watershed Forest Area, Aloha+ Challenge; Division of Forest and Wildlife- DLNR (Hawaii; 2017) DLNR <https://dlnr.hawaii.gov/dofaw/30x30/#:~:text=These%20forests%20are%20the%20foundation,reduce%20the%20risk%20of%20wildfires.&text=The%20Division%27s%2030%20C%2730,forest%20protection%20and%20recreation%20opportunities.>

²²⁷ World Economic Forum. (n.d.). State of Hawai‘i. It.org US. (One Trillion Trees Pledge), <https://us.1t.org/pledge/state-of-hawaii/>

²²⁸ Aloha+ Challenge. (n.d.). *Natural resource management*. Retrieved September 5, 2025, from <https://alohachallenge.hawaii.gov/pages/natural-resource-management>

The recent 2025 federal funding cuts and freezes for AFOLU sectors has stopped vital projects on agriculture, forestry and ranch lands, as well as support to localized food markets and access to healthy local foods (via Da Bux and SNAP) for Most Vulnerable Communities (MVCs). Continued cuts to staffing and technical service providers will impede needed support for increasing efforts for food and water security as well as protecting and increasing carbon sinks.

Invasive species and wildfire are part of a feedback loop that continues to threaten agriculture, native ecosystems and lives. The frequency of wildfires in the Hawaiian Islands has increased by 400% over the last century. The combination of less rainfall and severe drought from climate change, along with the introduction and unmanaged growth of non-native grasses, have contributed to the increased frequency and intensity of wildfires across the State.²²⁹

Disruption to Indigenous food and management systems and island vulnerabilities that exist due to isolation, globalized and extractive economies, that have deforested more than half of all of Hawai‘i’s forests and eroded soils on important agricultural lands. Diversion of water resources and fracturing of the ahupua‘a system, the integrated land management system considering resources from the top of the mountain to the nearshore reefs, have left it challenging for many small farmers to find healthy spaces to grow foods. A vision of ahupua‘a systems recovery, a Hawaiian TEK co-evolved reciprocal ecosystems and food systems management, requires support and capacity facilitation by the State and private entities.

Gaps in data have always been an issue in the islands. The data sets and methodologies developed on the continent often does not include Hawai‘i and are not appropriate for Hawai‘i’s context. While some global tropical research may help frame a focus for learning the 2022 GHG inventory noted data weaknesses and gaps in the AFOLU sector, particularly as far as soil amelioration and carbon-smart agriculture and ecosystems regeneration is concerned. Efforts have been underway to close this research and data gap, particularly through the Climate Smart Commodities partnership and the University of Hawai‘i Manoa’s S(HEE)R lab; however, in 2025 both programs were canceled due to federal funding cuts. A commitment to recover and reinvigorate the essence of these programs and capabilities is essential if Hawai‘i is to have a fully informed strategy to maximize carbon sequestration and increase overall resilience to the impacts of climate change.

Community Concerns over challenges in local sustainable food production, the need to care for ‘āina, disrupted market supply chains, container ships and their emissions, threat of invasive species, the need for more planting of native trees and shrubs, the loss of wetlands all emerged in through CAP outreach. Consistently across ‘talk story’ gatherings and facilitated open-community feedback sessions across the islands, there was an expressed desire for more community engagement and natural resource management by and from communities, and for better resource and facilitation support for this.

²²⁹ Hawaii Invasive Species Council. (n.d.). *Invasive grasses in Hawai‘i and their impacts*. DLNR HISC. <https://dlnr.hawaii.gov/hisc/info/species/invasive-grasses-in-hawaii-and-their-impacts/>

Locally owned and facilitated ecotourism has helped to subsidize local food production and alleviated some of the pressures of profitability in the high-cost state allowing farmers, foresters and ranchers to pay higher wages and continue working on the ‘āina.

The newly passed **Hawai‘i ‘Green Fee’** will commence on January 1, 2026, and it is hoped to support agriculture, forest, and ecosystems recovery actions of utmost priority for Hawai‘i’s survival and wellbeing.

SNAP²³⁰ and **Da Bux**²³¹: Federally funded SNAP²³² (Supplemental Nutrition Assistance Program)²³³ has been experiencing significant budget²³⁴ 235 236 cuts²³⁷ and freezes²³⁸ throughout 2025, increasing food insecurity and hunger for most vulnerable populations in Hawai‘i. Da Bux is a Hawai‘i-statewide nutrition incentive program that offers 50% discounts on Hawai‘i-grown produce to those low-income shoppers paying with SNAP. Administered by The Food Basket and collaborating with the Hawaii Good Food Alliance, Da Bux facilitates increased access to local healthy foods for Hawai‘i’s most food insecure populations, while also strengthening and supporting local farmers and food hubs. An audit of food services procurement processes across State of Hawai‘i departments is needed to provide specific recommendations on procurement code amendments that will increase purchasing of locally produced food. Tax credits for agriculture producers that grow food for local consumption and food manufacturers who produce value-added products with locally grown crops would support acceleration of local food production and market webs. A plan for the development of a hatchery to enhance stock at loko i‘a (traditional fishponds) across Hawai‘i is also crucially needed. Lower income households would benefit from outreach education and access support to make healthy eating choices more viable.

²³⁰ Hawaii Foodbank. (n.d.). *SNAP — get help*. <https://hawaiifoodbank.org/get-help/snap/>

²³¹ DABUX. (n.d.). *For advocates*. <https://dabux.org/for-advocates> ; [Resources For DA BUX Advocates — Empower Your Advocacy Efforts Today!](#)[DA BUX at Grocery Stores: Get 50% Off Hawaii Grown Fruits & Veggies](#)[Resources For DA BUX Advocates — Empower Your Advocacy Efforts Today!](#)

²³² **CNBC** – “Government shutdown impacts SNAP funding, putting families at risk”

CNBC. (2025, October 23). *Government shutdown impacts SNAP funding, putting families at risk*.

<https://www.cnbc.com/2025/10/23/government-shutdown-impacts-snap-funding-putting-families-at-risk.html>

²³³ **Forbes** – “The SNAP Crash Has Started. It Will Hurt Millions”

Sherman, E. (2025, October 30). *The SNAP crash has started. It will hurt millions*. Forbes.

<https://www.forbes.com/sites/eriksherman/2025/10/30/the-snap-crash-has-started-it-will-hurt-millions/>

²³⁴ The New York Times. (2025, November 9). *Trump officials push states to ‘undo’ work to send full SNAP benefits*. <https://www.nytimes.com/2025/11/09/us/politics/trump-administration-states-undo-full-snap-food-stamps.html>

²³⁵ PBS NewsHour. (2025, November 7). *Trump administration renews Supreme Court appeal to keep full SNAP payments frozen*. <https://www.pbs.org/newshour/politics/trump-administration-renews-supreme-court-appeal-to-keep-full-snap-payments-frozen>

²³⁶ The Guardian. (2025, November 11). *I’m an American relying on food stamps. This country has turned us into lab rats | US federal government shutdown 2025*. <https://www.theguardian.com/us-news/2025/nov/11/food-stamps-snap-cuts-personal-essay>

²³⁷ CBS News. (2025, November 1). *With food stamps set to dry up Nov. 1, SNAP recipients say they fear what’s next*. <https://www.cbsnews.com/news/snap-benefits-food-stamps-november-shutdown/>

²³⁸ NPR. (2025, November 3). *Trump administration will fund SNAP food benefits at 50% the normal payment*. <https://www.npr.org/2025/11/03/nx-s1-5596121/snap-food-benefits-trump-government-shutdown>

Technical Assistance, Monitoring, and Knowledge Infrastructure: Scaling climate-smart practices requires more than funding. Farmers, ranchers, and land managers need access to science-based tools, data, and hands-on direct technical support. Support systems include the development of a consortium of State agencies, local universities, and non-profits to provide technical assistance and educational materials on best farming practices that improve carbon sequestration potential and increase soil quality, while supporting and strengthening economic viability of local climate-smart markets (including sufficient income generation for the land stewards or managers). Reporting standards to measure carbon sequestration of agricultural and conservation land, as appropriate to the conditions, ecocultures, and needs of Hawai‘i, are essential to responsibly evolve programming, funding, policy and support. Existing databases in the United States have been developed with metrics that do not apply to Hawai‘i conditions. There still exists a sizable gap in triangulated rigorous research (and therefore a gap in crucial data) as to Nature-based Solutions and Traditional Ecological Knowledge practices specific to Hawai‘i, as pertains to carbon sequestration. A formal assessment on the impact of development and land use upon carbon sequestration across Hawai‘i is needed, along with a rigorous collection of baseline data on food importation. To understand Hawai‘i’s vulnerability to climate shocks, stressors and supply chain disruptions, we need to have a clear and rigorously informed understanding of the precise conditions. This understanding will aid in strategically co-creating viable pathways to build food security and localized climate resilience.

A Localized Plant-Based Diet and Climate Change

The IPCC’s Special Report on Climate Change and Land (SRCCL)²³⁹ notes that higher consumption of animals and animal-based foods is consistently associated with higher environmental impact (GHG, land use).²⁴⁰ A systematic review of sustainable-diet studies estimated that dietary shifts could reduce agricultural GHG emissions by up to 70-80%, depending on the scale of change.²⁴¹ Climate-action movements are calling people to commit to a plant-based diet at least 1-2 days per week if not completely.²⁴² The United Nations states, “Animal-based diets have a high impact on our planet. Population growth and an increasing demand for meat and dairy results in the need to clear land and deforestation in order to make room for animal farms and growing animal feed.”²⁴³

²³⁹ [Special Report on Climate Change and Land — IPCC site](#), Arneth et al (2019). An IPCC Special Report on climate change, desertification, land degradation, sustainable land management, food security, and greenhouse gas fluxes in terrestrial ecosystems

²⁴⁰ Intergovernmental Panel on Climate Change – Special Report on Climate Change and Land. (IPCC SRCCL), Ch. 5 *Food Security* (2018) https://www.ipcc.ch/site/assets/uploads/sites/4/2020/05/Chapter-5_FINAL.pdf?

²⁴¹ *The Impacts of Dietary Change on Greenhouse Gas Emissions, Land Use, Water Use, and Health: A Systematic Review*; Aleksandrowicz L, Green R, Joy EJ, Smith P, Haines A.. PLoS One.2016 Nov 3;11(11):e0165797. doi: 10.1371/journal.pone.0165797. PMID: 27812156; PMCID: PMC5094759 <https://pubmed.ncbi.nlm.nih.gov/27812156/> .

²⁴² *Plant Based Diets Can Fight Climate Change*; Harrabin, BBC News; 7 August 2019 <https://www.bbc.com/news/science-environment-49238749>

²⁴³ *Your Guide to Climate Action: Food*; United Nations, ActNow, <https://www.un.org/en/actnow/food>. Accessed November, 2025.

10.5 County-Level Variations and Actions

County Authorities manage county parks, open spaces, and urban/rural forests that contribute to carbon sequestration and climate resilience; support wildfire preparedness and prevention; regulate land use, zoning, agricultural districts, and conservation development, shaping long-term land-use patterns; and implement or facilitate composting, green-waste diversion, and local food system programs. County-level decisions and policies are foundational to the protection of agricultural lands, forest health, and community resilience in Hawai‘i.

Hawai‘i County (Hawai‘i Island)

- The Agriculture and Food Systems Program leads planning and provides grants, policy coordination, advocacy, and extension services to farmers, foresters, aquaculture operations, and natural-resource users.
- The Agriculture Advisory Commission offers formal recommendations to the mayor regarding agricultural infrastructure, marketing, research, education, and outreach tied to the County's Agriculture & Food System Plan.
- The Native Forest Dedication property-tax program incentivizes reforestation and forest farming with reduced assessed values for forestry-designated land.

Maui County

- **Department of Agriculture** established in July 2022, is tasked with developing a diversified, resilient agricultural system to support local food security, ecosystem regeneration, and economic development. A 2024–28 Strategic Plan guides those goals.
- Maui County annually holds grant-readiness workshops and offers agricultural and farm expansion grants to local producers.
- The county maintains close partnerships with Maui County Farm Bureau and Maui Flower Growers' Association to promote farming development and industry advocacy.
- Created a Food & Nutrition Security Plan, overseen by county staff, food producers, and community leaders to assess vulnerabilities and coordinate long-term strategies.
- Public infrastructure investments include expanding Kula Agricultural Park and planning additional county agricultural parks to increase land access for local growers.

Kaua‘i County

- Kaua‘i County’s Office of Economic Development (OED) administers a competitive Agriculture Farm Expansion Grant program (FY 2024–25), funding local projects that expand agricultural capacity across the island. Awards announced in early 2025.
- Through its Agricultural Dedication Program, the county offers property-tax relief to land used for active farming or livestock. A recent ordinance expanded benefits and reduced administrative burdens for participants.
- Kaua‘i County collaborates with nonprofit groups and industry stakeholders to develop grant programs and technical assistance offerings for organizations, not individual farmers.
- The county leverages NRCS and SWCD programs like EQIP, CSP, and AMA to provide farmers/forest landowners with technical and financial support for soil conservation, water management, and habitat restoration under local planning frameworks.

City & County of Honolulu (O‘ahu)

- The county’s Division of Urban Forestry manages urban forestry, including tree acquisition programs, botanical gardens, and oversight of public tree plantings and canopy monitoring.
- City & County staff lead tree-planting, education (partners with the State Kaulunani Community Forestry Program).
- Citizen Forester programs (e.g. Ho‘olā‘au pilot), initiated under the State’s Kaulunani Community Forestry Program and funded in part via the County to expand urban canopy across neighborhoods has now been transferred to management by Smart Trees Pacific.
- The county spearheaded a \$3M agricultural grant program (funded via ARPA/Federal recovery funds), disbursing \$1M annually in 2022–24 to support farmers, ranchers, and growers on O‘ahu; it supports local food production and pandemic recovery efforts.
- Related forestry/urban forestry policy includes the “100,000 Trees by 2025” campaign, inviting residents to count and report trees planted to build canopy data and community stewardship.

10.6 Measure Descriptions and GHG Reductions

Emission reduction actions were evaluated to estimate the extent of their carbon sequestration potential. These actions include implementing Nature-based Solutions (NbS) through ecosystems restoration and agroforestry, and the promotion of agricultural soil amendments.

Calculations of GHG sinks emissions and reductions are extremely challenging due to significant data gaps in the AFOLU sector. The data sets and methodologies developed on the continental U.S. often do not include Hawai‘i’s soil types, forestry types or do not include Hawai‘i at all. The Climate Smart Commodities partnership, which was terminated by the USDA in 2025, eliminating \$249 million in funding to support Hawai‘i’s agriculture. The program was working to develop appropriate indicators and categories to better understand the carbon sink data from the carbon smart land management programs. This shows an unfortunate carry-over from a data challenge reported in the 2021 Hawai‘i Greenhouse Gas Emission Report²⁴⁴ and the AFOLU numbers thereby impact overall numbers. This potentially misses opportunities to demonstrate lower net emissions due to ecosystems recovery and carbon smart farming practices.

²⁴⁴ State of Hawai‘i Department of Health, Clean Air Branch. (2024, May 29). *2020 and 2021 greenhouse gas emissions inventory – Final report*. https://health.hawaii.gov/cab/files/2024/05/2020-and-2021-Inventory_Final-Report_5-29-24.pdf

MMT CO ₂ e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Agricultural Soil Emissions	0.14	0.14	0.14	0.13	0.13	2.83
Forest Carbon (sink)	(1.69)	(1.63)	(1.63)	(1.63)	(1.63)	(33.6)

Table 61: AFOLU Baseline Emissions.²⁴⁵

Measure: Agricultural Soil Amendment

This measure seeks to capture carbon in agricultural soils through soil amendments from local waste streams and agricultural practices that decrease GHG emissions. The following supporting actions are considered:

- Integrate waste and land management systems to recapture nutrients and generate soil carbon amendments using a Circular Economy (CE) approach, integrating ‘āina stewards, local meat processors, and agricultural producers.
- Incentivize the use of biochar through pyrolysis of dead or dying invasive tree species, which will be applied to soil (implemented at a pilot level through projects across the state).
- Make infrastructure investments in regenerative agriculture through soil health.
- Invest in infrastructure that facilitates climate-smart implementation practices through state funding for transitioning to or establishing carbon-smart land management practices such as reforestation, agroforestry, silviculture and silvopasture.
- Increase access to resources for land stewardship and agricultural production for more local farmers to get started within the agricultural sector, and education and support to thrive as part of an essential local food economy.
- Increase biosecurity and remove invasive and ecosystem-modifying species on private lands.
- State support for the creation of local composting businesses across the islands for the replacement of chemical fertilizers with composted organic matter and facilitated support for composting agencies to access larger markets and to have support to meet standard regulations.

Through a process of community feedback sessions and expert review, there was broad support for greater investment to support small and medium scale local farmers. As one community member stated, “Biochar, when done correctly and done repeatedly, increases the ability of the soil to hold CO₂ for centuries. We need more than pilot projects, we need to see our State invest in full system projects with presence and support for the long haul.” There were also repeated calls to protect and increase agricultural lands on all Hawaiian Islands, with policies that can help make local farming more fiscally and logistically feasible. The call for financial support for Indigenous Hawaiian land management practices through TKE was also voiced.

²⁴⁵ State of Hawai‘i Department of Health, Clean Air Branch. (2024, May 29). *2020 and 2021 greenhouse gas emissions inventory – Final report*. https://health.hawaii.gov/cab/files/2024/05/2020-and-2021-Inventory_Final-Report_5-29-24.pdf

Emission Reductions

These measures are expected to be able to reduce agricultural soil emissions by ~10%. Modeling of an agricultural soil amendment measure focused on decreased fertilizer use yielded the emissions reduction results in the table and figure below.

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Hawai'i	-0.01	-0.01	-0.01	-0.01	-0.01	-0.1
Honolulu	-0.01	-0.01	-0.01	-0.01	-0.01	-0.02
Kaua'i	-0.001	-0.001	-0.001	-0.001	-0.001	-0.02
Maui	-0.002	-0.002	-0.002	-0.002	-0.002	-0.04
Total	-0.01	-0.01	-0.01	-0.01	-0.01	-0.2

Table 62: Emissions Reductions From Agricultural Soil Amendment Measures for Milestone Years.

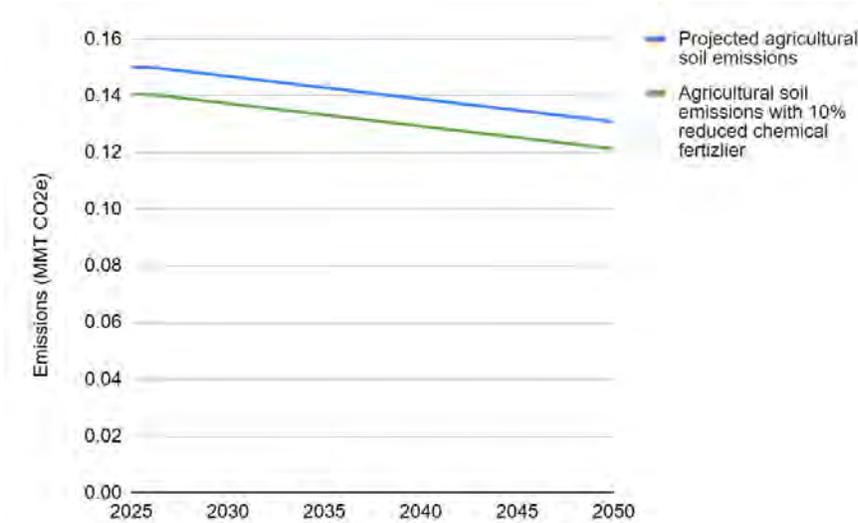


Figure 41: Emissions reductions potential from using 10% fewer chemical fertilizers

Co-pollutant Reductions

Note that no significant co-pollutant reductions are expected with agricultural soil amendments.

Measure: Tree planting (Nature-based Solutions, forests and wetlands)

According to the emissions inventory, carbon removals from AFOLU sinks have been decreasing since 1990 by roughly 1.6% between 1990 and 2021. As such, the effectiveness of these emissions sinks is expected to keep decreasing. Actions to increase carbon sinks through Nature-based Solutions (NbS) include restoration of forest ecosystems and wetlands. Nature-based solutions are sustainable with a wide range of co-benefits across climate resilience and mitigation, public health, food security and ecological health and wellbeing; they are low-cost, regenerative, and can be largely self-maintaining within a short timeframe. Food forests and traditional fishponds in particular offer a vast array of co-benefits for relatively low investment.

Hawai‘i has goals for restoring forest ecosystems by planting 11 million native trees and plants, preserving 23,000 acres of forested lands, and protecting 30% of priority watersheds by 2030 (843,000 acres). Priority areas for planting trees include:

- Degraded lands, to revitalize abandoned agricultural land and reduce wildfire risk;
- County-owned undeveloped or vacant lands;
- Mauka areas that benefit watershed capacity and quality; and
- Urban areas, to improve the health, resilience, and ecosystems, and to mitigate the impacts of heat.

Protecting and restoring wetlands follows from the Strategic Plan for Hawai‘i Wetlands, which targets restoring 20 wetlands and loko‘ia sites across Hawai‘i. This is supported by an intent to provide State and County budgets for infrastructure investments in aloha ‘āina projects. A plan for the development of a hatchery to enhance stock at loko i‘a (traditional fishponds) across Hawai‘i is also crucially needed. Additionally, it is crucial to support, engage, and take guidance from community loko i‘a stewards, and to more widely support sustainable fishery strategies across the state.

Through a comprehensive process of community feedback sessions and directed expert inquiry, there was a widespread prioritization for the restoration of ahupua‘a systems, and support for the traditional management practices for watershed, food forest and aquaculture recovery involving community management. As one community member stated, “These [nature-based] solutions not only provide climate action, but support recreation, mental health, culture, resilience, and more.” Concerns were also expressed for better wildfire management and mitigation, recovery of natural ecosystems for island survivability, caring for the water systems and ocean.

To help identify where tree planting can provide the greatest combined climate and equity benefits, high-suitability planting areas were mapped against Low-Income and Disadvantaged Communities (LIDACs) in Hawai‘i. LIDACs are identified using a combined economic and social vulnerability framework described in Section 7. This spatial analysis highlight's locations where strong biophysical feasibility aligns with higher community vulnerability, indicating priority zones for expanding reforestation and urban greening efforts. (See Figure below.)

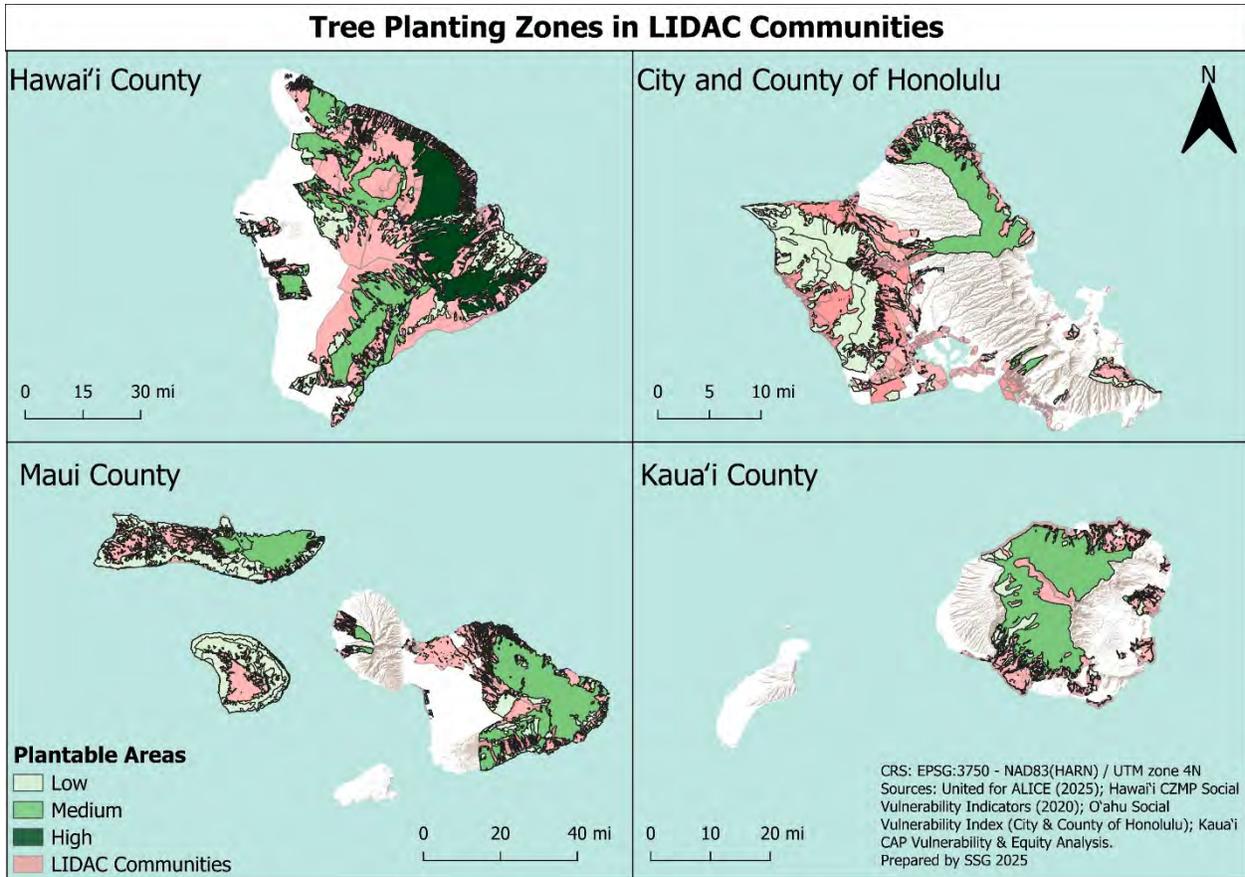


Figure 42: Tree-planting suitability areas located within LIDAC communities in Hawai'i. The LIDAC identification methodology is detailed in Chapter 8.

Emission Reductions

Action modeling shows that agricultural soil amendments and forest actions can reduce emissions across the state.

Assumptions:

- A 10% reduction in chemical fertilizer use from baseline levels was used as the statewide target for the Agricultural Soil Management action.
- County-level disaggregation for the soil management action was based on agricultural land area derived from the Agricultural Lands of Importance to the State of Hawai'i dataset.
- Agricultural soil carbon benefits were assumed to scale proportionally with county agricultural land area.
- For tree planting allocations, the statewide goal of planting 11 million trees by 2030 was used as the basis for determining county-level tree allocations.
- Four native tree species were selected to demonstrate potential carbon reduction capabilities. Actual planting will prioritize species appropriate to each ecosystem type, anticipated future climate conditions, and local water availability.
- County targets for tree planting were assigned using a weighted distribution that combines population share (40%) and plantable land area (60%).

The following table presents projected emissions reductions from tree planting measures across Hawai‘i’s counties between 2026 and 2045. Honolulu County achieves the largest cumulative reductions due to its higher allocation of trees under the 11-million tree goal.

MMT CO2e	Trees planted	2026	2030	2035	2040	2045	Cumulative 2026-2045
Hawai‘i	~ 6.5M	-0.08	-0.39	-0.39	-0.39	-0.39	-7.0
Honolulu	~ 1 M	-0.01	-0.06	-0.06	-0.06	-0.06	-1.0
Kaua‘i	~ 1.2 M	-0.01	-0.07	-0.07	-0.07	-0.07	-1.3
Maui	~ 2.3 M	-0.03	-0.14	-0.14	-0.14	-0.14	-2.44
Total	11M	-0.13	-0.65	-0.65	-0.65	-0.65	-11.7

Table 63: Emissions Reduction and Sequestration from AFOLU Actions (MM TCO2e) by county, in Milestone Years. Trees are distributed by county.

The following figure presents the carbon sequestration potential of the four tree species modeled in the Forest action. By 2030, cumulative emission reductions from tree planting are projected to reach approximately 650,000 MTCO2e. Sandalwood and ‘Ōhi‘a lehua contribute ~240,000 and ~160,000 MTCO2e respectively, while Mamane sequesters ~180,000 MTCO2e and Koa ~74,000 MTCO2e. These reductions remain constant through 2045, indicating that most sequestration occurs early and is sustained over time.

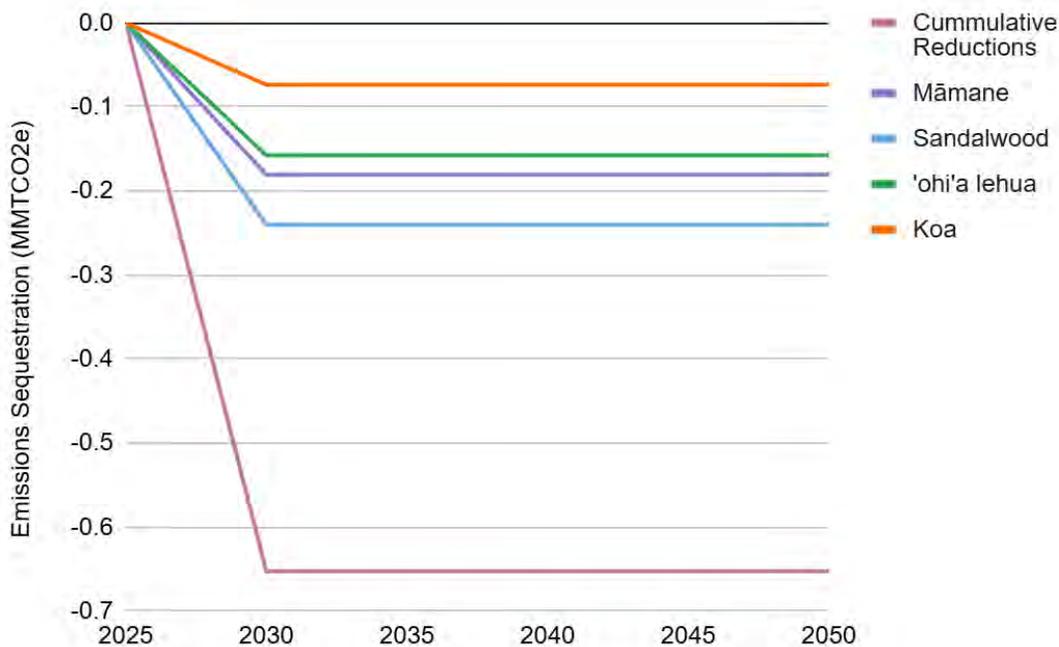


Figure 43: Emissions Sequestration by Tree Species.

Co-Pollutant Reductions

Table below presents the estimated co-pollutant reductions resulting from planting 11 million trees by 2030. In addition to carbon sequestration, tree planting can deliver substantial air quality improvements by reducing pollutants such as carbon monoxide (CO), nitrogen oxides (NOX), ozone precursors, fine particulate matter (PM2.5), and sulfur oxides (SO2). Once planted, they provide co-pollutant reductions ongoingly. These figures highlight the broader public health and environmental co-benefits of tree planting.

Co-Pollutant (MT)	2026	2030	2035	2040	2045	Cumulative 2026-2045
SO2	-101	-507	-507	-507	-507	-9,120
NOX	-8	-41	-41	-41	-41	-744
PM2.5	-17	-86	-86	-86	-86	-1,544
CO	-7	-35	-35	-35	-35	-634
Ozone	-119	-596	-596	-596	-596	-10,730

Table 64: Co-pollutant reductions from planting 11 million trees by 2030.

Further Resilience Measures

In addition to the mitigation-focused measures in this chapter, Hawai‘i must strengthen natural systems and land stewardship practices to address rapidly intensifying climate hazards. More frequent drought and rising temperatures are drying landscapes and fueling wildfire risk, especially in areas dominated by invasive grasses and hazardous tree species. This necessitates targeting invasive grasses near communities and critical facilities, maintaining defensible space around structures, and ensuring neighborhoods have safe evacuation routes and communications during fast-moving events. At the same time, heavier rainfall events and more extreme runoff are overwhelming degraded watersheds, accelerating erosion, and increasing sediment delivery to nearshore ecosystems.

Along Hawai‘i’s coasts, sea-level rise and stronger storm surges are eroding dunes, wetlands, and reef systems that traditionally buffered communities from waves and flooding. The following resilience measures respond directly to these pressures by reducing wildfire fuels, restoring reefs and coastal vegetation, improving watershed function, protecting freshwater resources, and revitalizing wetlands and loko i‘a that provide natural defenses and cultural value.

Wildfire risk reduction

Resilience measures to address the increasing risk of wildfires include the removal of invasive grasses and shrubs in high-fire-risk zones. Broad landscape-scale, cross-boundary fuel management is to be undertaken through the removal of invasive grasses and hazardous trees such as buffel grass, guinea grass, fountain grass, and Albizia along with intensive replanting of moisture-retaining native species. Homes, facilities, and other critical infrastructure must maintain

defensible space appropriate to local fire-risk zones to reduce ignition potential and structure loss. Greenbelts and firebreaks using drought-tolerant natives and maintain road-edge fuel breaks along evacuation routes are necessary to incorporate.

COST: \$412.5 million. According to the Climate Advisory Team’s policy recommendations, such actions would require approximately \$82.5 million per year. This equates to about \$412.5 million over the first five years to maintain ongoing, cross-boundary fuel management at the scale necessary to reduce wildfire ignition and loss.²⁴⁶

Watershed protection

The value of ecosystems services provided by the Ko‘olau Mountains on O‘ahu alone is estimated at \$7.4-14 billion dollars.²⁴⁷ Habitats range from mesic koa-‘ohi‘a forests to cliffs, from subalpine shrublands to grasslands, from dry forests to young lava flows and tubes, and from wetland bogs to coastal systems. Additionally, 239 threatened and endangered plants and animals (nearly 20% of the nation’s total listed species), 499 rare plants and animals, and hundreds of other common native species can be found in these forested areas. Most management actions are habitat based and revolve around combating the main threats of ungulate (hooved animals such as goats, deer, sheep, pigs, etc.) and invasive species. Examples include ungulate removal, invasive species control, outplanting, and restoration. Not only do these management actions benefit native forests and watersheds, but they also benefit our coastal and coral reef areas as well by reducing erosion and sedimentation effects in streams and during heavy rains. Management actions address large landscapes and threats affecting multiple habitats and species they leverage limited dollars for maximum benefits and allow the pooling of resources as well as expertise to reduce redundancy efforts; provide capacity building for landowners; and actions conserve other ecosystem services such as water, recreation, culture, education, and jobs.

COST: \$275 million. According to the Climate Advisory Team’s recommendations, sustaining such actions would require approximately \$55 million per year. This represents about \$275 million over 5 years, supporting the landscape-scale actions necessary to protect native ecosystems, safeguard water supply, and reduce downstream erosion and sedimentation impacts.²⁴⁸

²⁴⁶ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. Accessed from https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

²⁴⁷ Brooks et al. (1999) The Economic Value of Watershed Conservation. Accessed December 7, 2025 <https://uhero.hawaii.edu/wp-content/uploads/2019/08/EconValueWatershed.pdf>

²⁴⁸ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. Accessed from https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

Fortification of natural protections

To buffer surge and wave run-up, restoration of reefs, dunes, wetlands, fishponds, and native coastal vegetation is crucial. Watershed protection is most effectively implemented through native forest planting, the creation of riparian buffers, and introduction of stream setbacks to reduce peak flows and sediment loads. Water conservation and demand-management strategies can be implemented with an expansion of water conservation programs, alongside an increase in the use and availability of recycled and reclaimed water, and the regulation and management of water demand across sectors, to protect aquifer recharge, support streamflow, and reduce drought and wildfire risk. Wetlands and loko i‘a must be restored, and understood, as natural, ‘whole systems’ resilience infrastructure. The State of Hawai‘i could streamline permitting, strengthen community-based management, enhance monitoring and resilience planning through the Ho‘āla Loko I‘a program, and complete statewide inventories of loko i‘a to support long-term stewardship and climate adaptation.

10.7 Key Implementing Agencies

The Agriculture, Forestry, and Other Land Use (AFOLU) sector in Hawai‘i depends on the coordinated work of state agencies, counties, research institutions, and cross-sector partnerships. These entities manage forests, agricultural lands, invasive species, watersheds, and conservation areas that are central to carbon sequestration, ecosystem health, and climate resilience.

Hawai‘i Department of Land and Natural Resources (DLNR) is the State’s primary land and natural resources management agency, administering millions of acres of public trust lands, forest reserves, natural area reserves, coastal zones, and wildlife habitats. DLNR is the backbone of Hawai‘i’s natural carbon sequestration strategy and are central to protecting the ecological systems that underpin climate resilience. DLNR’s authority spans the protection of native ecosystems, watershed management, biodiversity conservation, and sustainable use of forest resources all core elements of the AFOLU sector.

DLNR, Division of Forestry and Wildlife (DOFAW) oversees the stewardship of State Forest Reserves, Natural Area Reserves, Game Management Areas, and other public lands where forest health, wildfire prevention, biodiversity, and carbon sequestration intersect. DOFAW executes a broad suite of AFOLU-relevant programs, including:

- **Forestry Program:** Manages reforestation, forest health monitoring, sustainable timber harvest, carbon-focused forest management, and statewide forest restoration projects.
 - **Kaulunani Urban and Community Forestry Program:** Funding and coordinating tree planting, urban canopy expansion, green infrastructure, and community forest management that contribute to carbon sequestration and heat mitigation.
 - **Forest Stewardship Program (FSP):** Provides financial and technical assistance to private landowners for long-term forest management, agroforestry, restoration forestry, and carbon-smart land management plans.

- **Carbon Smart Land Management Assistance:** Supports landowners, organizations, and agencies in adopting soil-carbon enhancement, regenerative agriculture, reforestation, and climate-smart land management practices.
- **Wildlife program:** Manages both hunting game and native species through ecosystem management, invasive species control, captive propagation, and outreach.
 - **Hawai'i Invasive Species Council (HISC)** is a cross-departmental council established in 2003 to coordinate statewide strategy on invasive species prevention, detection, control, research, and education. HISC's functions include issuing interagency policy guidance and resolutions; providing strategic funding for rapid response and long-term invasive-species management; coordinating research, prevention, and early detection efforts; and supporting the network of island-based Regional Invasive Species Committees (RISCs), which carry out on-the-ground eradication, outreach, and rapid response. HISC's collaborative model enhances efficiency, reduces duplicative efforts, and is central to protecting the ecosystems and agricultural systems that serve as key carbon sinks.
- **Native Ecosystems Protection and Management (NEPM):** Protects priority native ecosystems through fencing, ungulate control, invasive species removal, and habitat restoration. NEPM guides island-specific conservation action and houses several major sub-programs:
 - **Watershed Partnerships:** Multi-landowner alliances that cooperatively protect high-elevation forested watersheds, supporting long-term water security, biodiversity, and carbon sequestration.
 - **Natural Area Partnership Program (NAPP):** A public-private partnership that provides cost-share support for conservation management on privately owned natural areas with high ecological value.
 - **Legacy Land Conservation Program (LLCP):** Provides grants to acquire and permanently protect high-value conservation, agricultural, and cultural lands, including forests critical for carbon storage.
 - **Plant Extinction Prevention Program (PEP):** Prevents extinction of the state's rarest plants through propagation, seed banking, invasive-species control, and climate-adaptive conservation strategies.

Hawai'i Department of Transportation (HDOT) although primarily focused on transportation infrastructure, HDOT manages extensive rights-of-way, vegetated corridors, and coastal lands that influence wildfire risk, erosion, watershed quality, and landscape-scale vegetation patterns. HDOT contributes to AFOLU goals through:

- wildfire mitigation and fuel reduction along transportation corridors;
- green infrastructure and erosion control in areas where highways intersect sensitive watersheds;
- carbon-smart vegetation management such as native planting and invasive-species control near roads, airports, and harbors; and
- interagency collaboration on watershed protection where infrastructure traverses forested or agricultural lands.

Hawai‘i Army National Guard (HIARNG) / Department of Defense (DOD) manages extensive training lands that include native forests, grasslands, rangelands, and watershed areas. These lands serve as important carbon reservoirs and habitat for numerous threatened and endangered species. Guided by their **Integrated Natural Resources Management Plans (INRMPs)** that govern forest restoration, habitat management, invasive species control, erosion mitigation, and wildfire management on military lands DOD partners with watershed partnerships and other land managers to coordinate landscape-level conservation. Due to the nature of their activities DOD also conducts large-scale fuel reduction to reduce wildfire risk on and adjacent to training areas.

Hawai‘i Department of Agriculture and Biosecurity (DABS) is the lead agency for agricultural production, food security, soil health, and statewide biosecurity efforts. Agriculture is a major land-use sector in Hawai‘i, and DABS shapes the adoption of climate-smart agricultural practices. HRS 155–4 identifies DABS as the agency responsible for biosecurity and invasive species management regulated through HRS 150A – the “Hawai‘i Plant Quarantine Law” and Hawai‘i Administrative Rules Chapters 4-70 – Plant Import Rules, 4-71 – Non-Domestic Animal Import Rules, 4-71A – Microorganism Import Rules, 4-72 – Plant Intrastate Rules, and 4-73 – Plant Export Rules. Relevant divisions and programs include:

- **Agricultural Resource Management Division (ARMD)**, which manages State Agricultural Parks and irrigation systems that enable expanded local food production and regenerative agriculture.
- **Plant Industry Division – Biosecurity Program**, responsible for preventing the introduction and spread of invasive species that threaten crops, rangelands, and forests—protecting both ecological carbon stocks and agricultural productivity.
- **Market Development and Quality Assurance Programs**, which support local production systems, reduce reliance on imported agricultural goods, and promote soil health, certification, and reduced reliance on synthetic inputs.

University of Hawai‘i and the College of Tropical Agriculture and Human Resources (CTAHR) provide essential research, innovation, workforce development, and community outreach that support AFOLU mitigation and adaptation. Their work underpins many of the climate-smart practices adopted across the state. Key contributions include:

- producing research on soil carbon, agroforestry, tropical silviculture, regenerative agriculture, and climate-resilient crop systems;
- operating Cooperative Extension Services that assist farmers, ranchers, and landowners in implementing best practices for soil health, reduced emissions, and climate resilience;
- managing research stations across multiple islands that provide testing grounds for sustainable agricultural systems; and
- developing decision-support tools, climate models, and land-use analyses that inform policy and resource management.
- Launching, facilitating and implementing the Climate Smart Commodities Partnership for 2 years, supporting farmers and other producers across the islands, and contributing to the Natural and Working Lands Hui for Hawai‘i, and creating the metrics and systems for calculating carbon sequestration and GHG above ground and in the soil, as specific to the Hawaiian context.

City & County of Honolulu Department of Planning & Permitting (O‘ahu) & City & County of Honolulu Department of Parks and Recreation: These are the lead county agencies for zoning, land-use permitting and enforcement, and county parks, open spaces, and recreational lands (including urban forests). Through planning & permitting, the Department regulates land use, zoning, and special management areas (SMAs), shaping long-term land-use patterns. Through Parks & Recreation (and related functions such as the county’s botanical gardens), the county manages parks, open spaces, and urban-forest/green-space assets that contribute to carbon sequestration and community resilience.

Maui County Department of Planning & Maui County Department of Parks and Recreation: On Maui (and its associated islands: Moloka‘i, Lāna‘i), the Planning Department oversees zoning, general plans, community plans, development permits, and long-range land-use planning. The Planning Department also reviews Special Management Area (SMA) permits, zoning amendments, and land-use proposals — affecting agriculture, conservation, and development patterns. The Parks & Recreation Department manages parks, open spaces, and green infrastructure, and its “Parks Planning” unit undertakes planning for natural and recreational resources in ways that overlap with climate resilience and ecosystem stewardship. In addition, the county has a local advisory body, the Maui County Arborist Committee reviews public-area landscape planting, recommends exceptional tree protection, and contributes to urban forestry and tree-canopy decisions in public areas.

Kaua‘i County Planning Department & Kaua‘i County Department of Parks & Recreation, Kaua‘i Public Access, Open Space, and Natural Resources Preservation Fund Commission: On Kaua‘i, the Planning Department administers zoning and subdivision ordinances, enforces land-use regulations, issues zoning/use permits and SMAs, and guides long-range land-use planning via the General Plan. The Parks & Recreation Department manages the county’s parks, recreation facilities, and public green space, which includes open-space stewardship and maintenance of vegetation, recreation lands and community parks. The Kaua‘i Public Access, Open Space, and Natural Resources Preservation Fund Commission identifies and recommends lands for conservation acquisition or protection — including forest, watershed and open-space lands — to preserve ecosystem health, natural habitats, coastal and watershed resilience, and public access.

Hawai‘i County Planning Department & Hawai‘i County Department of Parks & Recreation: On Hawai‘i Island, the Planning Department oversees the County’s General Plan and Community Development Plans (CDPs), which guide long-term land use, zoning, conservation development, and capital improvements (infrastructure, parks, water, etc.). Through zoning and subdivision codes the Planning Department regulates where agriculture, conservation, residential, and urban uses may occur — shaping land-use patterns important for AFOLU outcomes. The Department of Parks & Recreation maintains beach parks, community parks, regional parks, open spaces, and other public lands and recreation facilities — all of which contribute to green-space, public access, and ecological resilience.

10.8 Implementation Schedule and Milestones and Metrics for Tracking Progress

AFOULU MEASURES		
Action	Schedule	Metrics
Agricultural soil amendment	Work with agricultural producers to phase out at least 10% of chemical fertilizer use by 2045.	Volume of chemical fertilizer use. Acres of organically certified agricultural land.
Plant 11 million native trees and plants, preserving 23,000 acres of forested lands and protecting 30% of priority watersheds (843,000 acres).	Action to be completed by the end of 2030, requiring: <ul style="list-style-type: none"> • Planting ~2 million trees annually • Designating ~4.6 thousand acres of forested lands as protected annually • Protecting 6% of priority watersheds as protected annually 	Annual acres of planted and acres of protected lands.

Table 65: AFLOU Sector Measures Implementation Schedule and Milestones.

10.9 Cost Estimates for Implementation

Agricultural Soil Amendments

Financial calculations for these agricultural soil amendment measures are complex and there a variety of unknowns. Therefore, costs and savings calculations were limited to fertilizer use under these assumptions:

- Annual cost of fertilizer, lime and soil conditions = \$30M (Hawai‘i’s Department of Agriculture for 2022).²⁴⁹
- Average 2022 cost of potash fertilizer = \$831/ton.²⁵⁰
- Average 2025 cost of compost (Average prices were calculated from Hawaiian Earth Recycling (n.d.) and Organic Matters Hawaii [n.d.]) = ~\$215/ton.^{251 252}

Under these assumptions, replacing 10% of fertilizer with compost yields the results in the following table – a \$2.5M/year savings.

²⁴⁹ Hawai‘i Department of Agriculture. November 2024. *Farm Production Expenses Statistics*. Accessed November 29, 2025: https://dab.hawaii.gov/add/files/2024/12/Farm-Production-Expenses-2007-2022_SOH_11.26.24.pdf

²⁵⁰ Progressive Farmer. July 2022. *DTN Retail Fertilizer Trends*. Access November 29, 2025: <https://www.dtnpf.com/agriculture/web/AG/crops/article/2022/12/07/fertilizer-prices-continue-mostly>

²⁵¹ Hawaiian Earth Recycling. (n.d.). *Compost & soil prices*. <https://hawaiianearth.com/compost-soil-prices>

²⁵² Organic Matters Hawaii. (n.d.). *Products*. <https://www.organicmattershawaii.com/products>

\$ millions	2026	2030	2035	2040	2045	Cumulative 2026-2045
Cost of potash fertilizer	30.0	30.0	30.0	30.0	30.0	600
Cost of 90% potash + 10% compost	27.5	27.5	27.5	27.5	27.5	550
Difference (savings)						(50)
NPV (3%)						(38)

Table 66: Costs of Typical Fertilizer use on Hawai‘i Agricultural Lands Versus the Cost of Replacing 10% of Fertilizer with Compost Material.

Tree Planting

Implementing the tree planting action would cost roughly \$220 million. This assumes a cost of \$20 per tree. Much of this investment would be on Hawai‘i Island, where the most trees would be planted. This investment corresponds to the highest emissions reduction potential.

\$ millions	Hawai‘i	Honolulu	Kaua‘i	Maui	Total
Tree Planting	130	20	24	36	220

Table 67: Costs for planting 11-million trees by 2030.

10.10 Funding Sources

The federal funding landscape for AFOLU projects has been dramatically impacted by actions taken by the current administration. Agricultural federal funding for Hawai‘i has experienced pauses or cuts to the Farm to School initiative, water delivery projects and funds to boost food production in Hawai‘i. With substantial impacts to the DOI, EPA, NOAA and other agencies that fund restoration and conservation activities the federal funding landscape has substantially declined, with climate-change mitigation and adaptation projects no longer supported, the majority of federal funding for the natural environment is now focused on disaster preparedness and response. \$249 million dollars (36% of the value of Hawai‘i’s annual agricultural economy) in paused, eliminated or uncertain federal funds⁵, including the elimination of the Carbon Smart Commodities (CSC) grant from the USDA and other land manager supportive program such as the Expanding Agroforestry Program. Eliminating seven projects covering 23 major commodities and 71 climate-smart and supporting practices, CSC was expected to jumpstart a long list of climate-friendly agricultural initiatives, from planting food forests to managing invasive species and improving soil health, while also boosting local food production. On top of this the State Carbon Smart Land Management Assistance Pilot Program within the DLNR, that incentivized carbon sequestration activities on farms and forests through compensation contracts for eligible practices sunset in 2025. While the majority of private sector has not changed its focus on funding for agriculture, environmental, and climate change-related projects, the competition for these limited funds has intensified.

Food and Agriculture:

Federal Funds

In Hawai‘i, the U.S. Department of Agriculture National Institute of Food and Agriculture, Agriculture and Food Research Initiative Competitive Grants Program Education and Workforce Development provides federal grants to strengthen education, training, and research in agriculture, natural resources, and environmental sciences. Grants range from \$22,000 to \$750,000 per project, with a total of roughly \$49 million nationally each year, and can support initiatives in Hawai‘i that promote climate-resilient agriculture, sustainable food systems, bioenergy, and natural resource management.²⁵³

U.S. Department of Agriculture National Institute of Food and Agriculture, Farm to School Grant Program supports Hawai‘i schools and communities in building local food systems by funding school gardens, purchasing locally grown foods, and providing nutrition and agricultural education. Grants for Hawai‘i projects range from approximately \$100,000 to \$500,000 per award, with a portion of the national \$18 million funding cycle available to support these initiatives.²⁵⁴

In Hawai‘i, the U.S. Department of Agriculture Natural Resources Conservation Service (NRCS) Programs & Initiatives includes climate-smart land-management funding through programs such as Environmental Quality Incentives Program (EQIP), Conservation Stewardship Program (CSP), Regional Conservation Partnership Program (RCPP), and Agricultural Conservation Easement Program (ACEP), providing financial and technical support for soil health, water conservation, carbon sequestration, and climate-resilient agriculture. Through Environmental Quality Incentives Program (EQIP) in Hawai‘i, producers and forest-landowners can receive financial and technical assistance for conservation practices (soil health, water conservation, erosion control, habitat restoration, etc.). The payment rates for each practice under EQIP (in Hawai‘i) are defined annually on NRCS’s Hawaii/Pacific Islands payment schedule, which adjusts for local labor/material costs and opportunity-cost compensation. Under Conservation Stewardship Program (CSP), landowners in Hawai‘i may receive long-term payments for improved land stewardship and for implementing enhanced conservation practices although exact per-property dollar amounts vary depending on the plan and practices adopted. For Regional Conservation Partnership Program (RCPP), a recent award for forest-enhancement work in Hawai‘i directed \$5 million toward invasive species control and native-forest restoration on private lands.²⁵⁵

The Western Sustainable Agriculture Research and Education (Western SARE) program funds climate-resilient and sustainable agriculture in Hawai‘i through grants that support on-farm research, soil-health improvements, carbon-sequestering practices, and other sustainable-agriculture innovations. Grant amounts range from up to \$35,000 for

²⁵³ U.S. Department of Agriculture National Institute of Food and Agriculture, Agriculture and Food Research Initiative Competitive Grants Program Education and Workforce Development, accessed December 5, 2025, <https://www.nifa.usda.gov/grants/funding-opportunities/agriculture-food-research-initiative-foundational-applied-science>

²⁵⁴ U.S. Department of Agriculture Food and Nutrition Service Farm to School Grant Program, accessed December 5, 2025, <https://www.fns.usda.gov/grant/f2s/fy26>

²⁵⁵ U.S. Department of Agriculture Natural Resource Conservation Service Programs and Initiatives, accessed December 5, 2025, <https://www.nrcs.usda.gov/>

“Farmer/Rancher” projects to as much as \$350,000 for multi-year “Research & Education” projects.²⁵⁶

State Funds

The Hawai‘i Department of Agriculture Specialty Crop Block Grant Program supports climate-resilient agriculture and sustainable food systems by funding projects that boost production and market development of Hawai‘i’s specialty crops (fruits, vegetables, nuts, nursery crops, etc.). In fiscal 2025 the program offered a total of \$512,663, with individual grants ranging from \$20,000 to \$50,000 per project.²⁵⁷

State of Hawai‘i Agricultural Loan Division offers a variety of climate related funds such as the Emergency Loan Program for Maui and Hawai‘i Island Farms and Ranchers Impacted by High winds and Wildfires, Alternative Energy Loan Program, and other loans. As well as providing information about other funding sources.²⁵⁸

County Funds

The County of Hawai‘i Department of Research and Development offers “Impact Grants” to support climate-friendly agricultural and food-system projects, including sustainable farming, innovative food production, and resilience efforts on Hawai‘i Island. For fiscal year 2024-2025 the program awarded \$548,095 spread across 31 projects, and for 2025-2026 it has committed \$386,300 for 19 projects, providing funding typically in the range of \$10,000–\$25,000 per grant.²⁵⁹

In Maui County, the County of Maui Sustainability Grants Program offers funding for climate-friendly agriculture and environmental resilience: for FY 2026, the program includes a Renewable Energy Grant pool of \$100,000 for clean-energy and efficiency projects, and an Environmental Protection & Green Grant pool of \$460,000 for sustainability, restoration, and resilience initiatives.²⁶⁰

The City and County of Honolulu Grants-in-Aid program funds nonprofit projects with environmental and community-benefit purposes that can include sustainable-agriculture and resilience work. Recent GIA awards for environment and community projects have ranged roughly from \$10,000 up to about \$150,000.²⁶¹

²⁵⁶Western Sustainable Agriculture Research and Education Grants, accessed December 5, 2025, <https://western.sare.org/grants/>

²⁵⁷ State of Hawai‘i Department of Agriculture & Biosecurity Specialty Crop Grant Program, accessed December 5, 2025, <https://dab.hawaii.gov/blog/main/nr25-12scbgp/>

²⁵⁸ State of Hawai‘i Agricultural Loan Division Other Funding Sources, accessed Dec 5, 2025, <https://dab.hawaii.gov/agl/>

²⁵⁹ County of Hawai‘i Research & Development Grants, accessed December 5, 2025, <https://www.rd.hawaii-county.gov/funding-grant-resources>

²⁶⁰ County of Maui Sustainability Grants, accessed December 5, 2025, <https://www.mauicounty.gov/252/Grants-Management-Division>

²⁶¹ City and County of Honolulu Department of Community Services Grants in Aid Application Guidelines, accessed December 5, 2025, <https://www.honolulu.gov/dcs/dcs-ogm-grants-in-aid-application-guidelines/>

The County of Kaua‘i Office of Economic Development (OED) offers grants to support climate-resilient agriculture and sustainable practices under programs like the Agriculture Farm Expansion Grant (AFEG), with individual awards ranging from \$15,000 to \$100,000 per project²⁶²

Public-Private & Philanthropic Partnerships

Agricultural Leadership Foundation of Hawaii: The Agricultural Leadership Foundation of Hawaii provides grants and scholarships to support sustainable agriculture, food-system education, and community-based natural-resource stewardship across the islands. In 2024 its total revenues were approximately \$573,530, funding statewide seminars, youth-agriculture scholarships, and workshops aimed at building capacity for resilient and climate-aware farming.²⁶³

Hawai‘i Agricultural Foundation: The Hawai‘i Agricultural Foundation (HAF) supports climate-resilience and sustainable agriculture in Hawai‘i through its Farmer Assistance programs, offering grants and technical support to local farmers and ranchers. Recent awards include individual grants such as \$30,400 distributed to local farmer-support organizations.²⁶⁴

Kamehameha Schools: The Kamehameha Schools “Mahi‘ai Match-Up” supports climate-resilient and locally rooted agriculture in Hawai‘i by offering food-system entrepreneurs cash prizes, mentorship, and access to agricultural land. Prize awards typically come from a roughly \$40,000 total pool, with individual cash awards ranging from about \$5,000 to \$25,000, and winners often receive land-lease agreements on ‘Āina Pauahi lands to grow food, restore native crops, or build climate-resilient farms.²⁶⁵

The Bayer Fund: The Bayer Fund supports programs aimed at improving access to healthy food and nutrition, which can advance climate-resilient and sustainable food-system goals. Grant awards vary depending on organization size and project scope; in recent years, the Fund’s total grants to nonprofits across the U.S. have reached more than \$12 million annually, and individual Food & Nutrition grants typically do not exceed 25 % of an organization’s operating budget.²⁶⁶(note: they only fund work in Haleiwa & Kunia on O‘ahu, Kaunakakai on Molokai and Kihei on Maui)

American Public Gardens Association Urban Agriculture Resilience Program: The American Public Gardens Association’s Urban Agriculture Resilience Program provides \$5,000–\$20,000 grants, and up to \$55,000 for capstone projects, to support community-based urban agriculture that

²⁶² Count of Kaua‘i Grant Information, accessed December 5, 2025, [https://www.Kaua‘i.gov/Government/Departments-Agencies/OED/Grant-Information](https://www.Kaua'i.gov/Government/Departments-Agencies/OED/Grant-Information)

²⁶³ Agricultural Leadership Foundation of Hawai‘i Program, accessed December 5, 2025, <https://www.agleaderhi.org/>

²⁶⁴Hawai‘i Agricultural Foundation Farmer Assistance Program, accessed December 5, 2025, [https://www.Hawai‘iagfoundation.org/](https://www.Hawai'iagfoundation.org/)

²⁶⁵ Kamehameha Schools Mahi`ai Match-up accessed December 5, 2025, <https://www.ksbe.edu/mahiai>

²⁶⁶ Bayer Fund Food and Nutrition Grant Program, accessed December 5, 2025, <https://www.fund.bayer.us/grant-programs#grant-programs-1>

strengthens local food security and climate resilience. This funding can assist Hawai‘i organizations advancing climate-friendly food production and sustainable agriculture efforts.²⁶⁷

Ulupono Initiative: The Ulupono Initiative provides grants and impact investments in Hawai‘i to support local-food production, renewable energy, clean transportation, and sustainable freshwater and land-use practices, helping advance climate-resilient agriculture and food-system self-sufficiency. Most Ulupono grants are under \$100,000, with funding rarely exceeding \$200,000; this makes them well-suited for small- to medium-scale projects like local agriculture, renewable-energy installations, or supply-chain improvements on the islands.²⁶⁸

Kaiser Permanente Corporate Giving Programs Healthy Communities: The Kaiser Permanente Healthy Communities grant program in Hawai‘i supports food and agriculture initiatives that promote access to nutritious food, healthy eating, and sustainable food systems. Grant amounts vary by year and project, typically ranging from \$10,000 to \$50,000 for community-based programs.²⁶⁹

Natural lands:

Federal Funds

The National Science Foundation Water, Landscape, and Critical Zone Processes program funds research on how water, soils, and Earth-surface processes respond to environmental change. This research can inform climate resilient land use, watershed protection, and ecosystem adaptation in Hawai‘i. The current funding opportunity allocates approximately \$23.85 million nationwide, with about 60 to 80 grants expected, and individual awards vary depending on project scope.²⁷⁰

Bureau of Reclamation WaterSMART Aquatic Ecosystem Restoration Program provides federal grants for study, design, and construction of aquatic habitat restoration and fish passage projects. In Hawai‘i, these projects could help restore stream flows, support native species, and improve watershed and coastal resilience under climate stress. Grant awards generally range from \$500,000 to \$2,000,000 for design and planning projects and from \$3,000,000 to \$10,000,000 or more for construction and restoration projects.²⁷¹

The Federal Emergency Management Agency Hazard Mitigation Grant Program provides funding to Hawai‘i through the Hawai‘i Emergency Management Agency for hazard resilience and climate adaptation projects such as flood protection, drainage improvements, infrastructure retrofits, or relocation of hazard prone properties. The most recent statewide allocation under the program is

²⁶⁷ American Public Gardens Association Urban Agriculture Resilience Program, accessed December 5, 2025, <https://members.publicgardens.org/grow-your-garden/promote/urban-agriculture/>

²⁶⁸ Ulupono Initiative Local Food Funding, accessed December 5, 2025, <https://ulupono.com/what-we-do/what-we-fund/>

²⁶⁹ Kaiser Permanente Corporate Giving Programs Healthy Communities, accessed December 5, 2025, <https://about.kaiserpermanente.org/expertise-and-impact/healthy-communities>

²⁷⁰ U.S. National Science Foundation Water, Landscape, and Critical Zone Processes funding opportunity, accessed December 5, 2025, https://www.nsf.gov/funding/opportunities/walcz-water-landscape-critical-zone-processes/nsf25-519/solicitation#pgm_intr_txt

²⁷¹ Bureau of Reclamation WaterSMART Aquatic Ecosystem Restoration Program, accessed December 5, 2025, <https://www.usbr.gov/watersmart/aquatic/index.html>

about \$24.7 million, available for communities to apply toward resilience against hazards like sea level rise, extreme storms, and wildfires.²⁷²

State Funds

Department of Land and Natural Resources, Legacy Land Conservation Program provides competitive grants, with approximately \$6.7 million expected to be available in the next grant cycle, to acquire and protect lands statewide that harbor important natural, ecological, coastal, agricultural, and watershed resources. These acquisitions support climate resilience in Hawai‘i by protecting forests, watersheds, coastal zones, and native habitats, helping safeguard biodiversity, water security, and carbon absorbing ecosystems.²⁷³

The Department of Hawaiian Home Lands issues annual community development grants under its Native Hawaiian Development Program Plan, with recent rounds distributing a total of roughly \$1.8 million statewide to support projects on existing homesteads. Individual grant proposals may request up to \$300,000. These grants can fund climate resilient agriculture, sustainable infrastructure, and community planning efforts that build resilience and support environmental stewardship across Hawaiian home lands.²⁷⁴

University of Hawai‘i at Manoa College of Tropical Agriculture and Human Resources Cooperative Extension Incentive Programs for Forest Landowners in Hawai‘i. The incentive programs offered through the University of Hawai‘i at Mānoa / Hawai‘i Department of Land and Natural Resources provide cost-share and financial support to private forest landowners for climate-resilient forestry management, including forest stewardship planning, native-forest restoration, watershed protection, and carbon-sequestration practices. Under the Forest Stewardship Program (FSP), landowners can receive 75% cost-share for development of a 10-year forest management plan and up to 50% cost-share for implementation of approved management practices.²⁷⁵

The Kaulunani Grant Program, run by Hawai‘i Department of Land and Natural Resources’ Division of Forestry and Wildlife, supports urban and community forestry in Hawai‘i by funding tree planting, canopy expansion, green space creation, and related climate resilience activities. Recent funding rounds have awarded between \$3,000 and \$15,000 for community forestry

²⁷² Federal Emergency Management Agency Hazard Mitigation Grant Program, accessed December 5, 2025, <https://www.fema.gov/grants/mitigation/learn/hazard-mitigation>

²⁷³ Department of Land and Natural Resources, Division of Forestry and Wildlife: Native Ecosystem Protection & Management, Legacy Lands Conservation Program, accessed December 5, 2025, [https://dlnr.Hawai‘i.gov/ecosystems/llcp/#:~:text=The%20Legacy%20Land%20Conservation%20Program%20\(LLCP\)%20provides,taxes%20%20**Money%20from%20the%20State%20Legislature**](https://dlnr.Hawai‘i.gov/ecosystems/llcp/#:~:text=The%20Legacy%20Land%20Conservation%20Program%20(LLCP)%20provides,taxes%20%20**Money%20from%20the%20State%20Legislature**)

²⁷⁴ Department of Hawaiian Home Lands Grants, accessed December 5, 2025, <https://dhhl.Hawai‘i.gov/category/dhhl/>

²⁷⁵ University of Hawai‘i at Manoa College of Tropical Agriculture and Human Resources Cooperative Extension Incentive Programs for Forest Landowners in Hawai‘i, accessed December 5, 2025, <https://cms.ctahr.Hawai‘i.edu/forestry/Education-Outreach/Forestry-Incentive-Programs/#:~:text=Restore%20and%20protect%20a%20native,Reduce%20your%20property%20taxes>

projects, with larger Year of Our Community Forests grants sometimes ranging up to \$10,000 to \$20,000.²⁷⁶

County Funds

The County of Hawai‘i Department of Research and Development offers “Impact Grants” that can be used for environmental-restoration, sustainability, and climate-resilience projects on Hawai‘i Island. Most recently, the county awarded \$548,095 to 31 projects in FY 2024–2025, and \$386,300 to 19 projects for FY 2025–2026.²⁷⁷

The Waiwai Grants in Aid program from the County of Hawai‘i provides \$2 million annually to qualified nonprofits island wide for projects that benefit the public, including environmental and sustainability work that can support climate resilience efforts. Recent award rounds under the program granted over \$2 million to 58 community level initiatives projects, including conservation, watershed, and food system resilience efforts.²⁷⁸

The County of Maui Sustainability Grants Program supports climate-related environmental restoration efforts in Maui through several targeted grant pools. For fiscal year 2026 the program offers \$460,000 in Environmental Protection & Green Grants (for conservation and restoration) and \$800,000 for Wetlands Restoration.²⁷⁹

City and County of Honolulu Department of Housing and Land Management Clean Water & Natural Lands Program. The Clean Water and Natural Lands Fund uses roughly 0.5% of O‘ahu property-tax revenue to acquire or conserve land for watershed protection, habitat preservation, open space, and flood/erosion mitigation for climate resilience in Honolulu.²⁸⁰

The County of Kaua‘i Office of Economic Development offers environmental-restoration opportunities through its Innovation Grant program, funding projects that support sustainability, watershed recovery, agro-ecology, and other climate-resilient practices. Recent funding rounds awarded a total of \$204,025 to selected projects, with individual grants ranging from \$5,000 to \$50,000.²⁸¹

²⁷⁶Department of Land and Natural Resources, Division of Forestry and Wildlife: Forestry Program, Kaulunani Grant Program, accessed December 5, 2025,

https://dlnr.Hawai‘i.gov/forestry/lap/kaulunani/grants/#:~:text=The%20Kaulunani%20Grant%20Program%20encourages%20community%20involvement,Community%20groups%20*%20State%20and%20county%20agencies

²⁷⁷County of Hawai‘i Research & Development Impact Grants, accessed December 5, 2025,

<https://www.rd.Hawai‘i county.gov/funding-grant-resources/impact-grants>

²⁷⁸ County of Hawai‘i Waiwai Grants-in-Aid, accessed December 5, 2025, <https://www.Hawai‘i county.gov/our-county/legislative/county-council/nonprofit-grants>

²⁷⁹ County of Maui Sustainability Grants, accessed December 5, 2025,

<https://www.mauicounty.gov/2725/Sustainability-Grants>

²⁸⁰ City and County of Honolulu Department of Housing and Land Management Clean Water & Natural Lands Program, accessed December 5, 2025, <https://www.honolulu.gov/dhlm/cwnl/>

²⁸¹ County of Kaua‘i Grant Information, accessed December 5, 2025,

<https://www.Kaua‘i.gov/Government/Departments-Agencies/OED/Grant-Information#:~:text=The%20County%20of%20Kaua‘i%20C%20through%20its%20Office,that%20promote%20and%20nurture%20sustainable%20economic%20development.>

Public-Private & Philanthropic Partnerships

Hawai‘i Community Foundation: The Hawai‘i Community Foundation (HCF) awarded more than \$8.3 million statewide in 2023 through its “Natural Environment” grants, supporting habitat restoration, coastal resilience, watershed protection, and ecosystem-recovery projects. Recent HCF-funded projects include a \$481,800 grant to the Kula Community Watershed Alliance (on Maui) for fire-land recovery, soil stabilization, and native-forest regeneration, and a \$150,000 grant to the Hawaiian Islands Land Trust for nearshore-water-quality and wetland restoration.²⁸²

Kosasa Foundation: The Kosasa Foundation supports climate-change resilience in Hawai‘i through its Community-Based Environmental Stewardship program, which funds projects aimed at protecting ecosystems, restoring native habitats, and building local resilience. Grants are typically in the \$10,000–\$50,000 range for small projects (up to 18 months) or larger multi-year projects when funding requests exceed \$50,000.²⁸³

Laura Jane Musser Fund: The Laura Jane Musser Fund Rural Initiative offers grants in Hawai‘i for community-based rural projects that can include environmental restoration, sustainable land use, or climate-resilient infrastructure. Eligible projects may receive up to \$5,000 for planning or up to \$25,000 for implementation per grant round.²⁸⁴

Catalyst Fund - Network for Landscape Conservation: The Catalyst Fund supplies competitive grants, typically between \$10,000 and \$25,000 per award, to place based landscape partnerships to build collaborative capacity for long term conservation, stewardship, and climate resilience planning.²⁸⁵

Marisla Foundation: The Marisla Foundation supports climate-change and ecosystem-resilience efforts in Hawai‘i through its Environment Program, which funds marine/coastal biodiversity conservation, pollution prevention, and sustainable ecosystem management. Grant sizes generally range from \$20,000 to \$100,000 per award.²⁸⁶

National Fish and Wildlife Foundation: The National Fish and Wildlife Foundation Five Star and Urban Waters Restoration Grant Program supports climate adaptation and environmental restoration across Hawai‘i, funding wetland, riparian, coastal, and watershed restoration, stormwater management infrastructure, habitat conservation, and community stewardship efforts.

²⁸² Hawai‘i Community Foundation Competitive Grants, accessed December 5, 2025, <https://www.Hawai‘icomunityfoundation.org/grants/open-applications>

²⁸³ Kosasa Foundation Community-based Environmental Stewardship, accessed December 5, 2025, <https://www.kosasafoundation.org/grants/>

²⁸⁴ Laura Jane Musser Fund Rural Initiative, accessed December 5, 2025, <https://musserfund.org/rural-initiative-program/>

²⁸⁵ Catalyst Fund - Network for Landscape Conservation, accessed December 5, 2025, <https://landscapeconservation.org/catalyst-fund/>

²⁸⁶ Marisla Foundation Environmental Program Grant, accessed December 5, 2025, <https://online.foundationsource.com/ws/index.jsp?site=marisla>

Grants through the program generally range from \$20,000 to \$50,000, with typical awards around \$35,000, for 12 to 18 month projects.²⁸⁷

²⁸⁷ National Fish and Wildlife Foundation Five Star Program, accessed December 5, 2025, <https://www.nfwf.org/programs/five-star-program?activeTab=tab-3>



11. Waste and Material Management

MEASURES

20. WASTE DIVERSION

21. WASTEWATER - Accelerate Cesspool Conversion

22. COMPOSTING

23. AVOIDING WASTE GENERATION

11. Waste and Material Management

11.1 Overview

Hawai‘i’s distinctive island geography and its relatively small economy present inherent and persistent challenges for effective waste management. The limited local market and the high operational costs associated with land values, labor, utilities, and specialized equipment mean that nearly all recyclable materials collected within the state must be shipped to larger processing facilities on the U.S. mainland or in Asia.²⁸⁸ This reliance on external markets introduces significant logistical complexities and economic vulnerabilities.

The State of Hawai‘i’s waste management sector operates under the oversight of the Office of Solid Waste Management (OSWM), which is a component of the Hawai‘i Department of Health’s (DOH) Solid and Hazardous Waste Branch (SHWB).²⁸⁹ OSWM’s three primary programs are the Deposit Beverage Container (DBC) Program, the Electronic Waste and Television Recycling and Recovery Program, and the Glass Advance Disposal Fee (ADF) Program. These programs are fundamental to achieving the state’s overarching waste reduction goals. The day-to-day operation of Waste Management are primarily the responsibility of the counties who operate waste collection and manage landfills.

Hawai‘i Revised Statutes (HRS) Section 342G-2 establishes a foundational hierarchy for solid waste management practices that guides both state and county strategies. This hierarchy prioritizes: 1) Source Reduction, 2) Recycling (inclusive of composting), and 3) Landfilling and/or Incineration. This statutory framework underscores a commitment to minimizing waste generation and maximizing resource recovery before resorting to disposal methods. The successful implementation of the initial two practices in this hierarchy is designed to reduce the volume of waste requiring landfilling or incineration.²⁹⁰

Beyond solid waste, the Hawai‘i Department of Health’s Wastewater Branch plays a crucial role in environmental protection and public health. This branch administers statewide engineering functions related to water pollution control, overseeing municipal and private wastewater treatment facilities, individual wastewater systems, including efforts to address cesspools conversion, and the Clean Water State Revolving Fund. A significant initiative within this branch is the Recycled Water Program, which has gained increasing importance due to Hawai‘i’s growing population, finite potable water resources, and challenges associated with wastewater disposal.²⁹¹

Hawai‘i has identified at least \$3.77 million in waste and materials management projects that are fully scoped and ready for implementation statewide. These initiatives aim to extend the life of existing transfer stations while accelerating the state’s efforts toward waste reduction. Planned

²⁸⁸ Office of Solid Waste Management Annual Report to the thirty-second Legislature State of Hawai‘i, accessed June 10, 2025, https://health.hawaii.gov/opppd/files/2024/03/27_2024-OSWM-Legislative-Report.pdf

²⁸⁹ Office of Solid Waste Management Annual Report to the thirty-second Legislature p.2

²⁹⁰ Office of Solid Waste Management Annual Report to the thirty-second Legislature State of Hawai‘i,

²⁹¹ Wastewater Branch - Hawai‘i State Department of Health. <https://health.hawaii.gov/wastewater/>

projects include expanding reuse and repair programs to keep materials in circulation longer, strengthening recycling systems for hard-to-process items, and building community-based composting networks to divert organics from the waste stream. Together, these efforts will reduce landfill pressure, lower emissions, and support more resilient and sustainable resource management practices across the islands.

To build true circularity and resilience in Hawai‘i’s waste sector, substantial investment in local processing capabilities or the development of innovative, high-value end-uses for recycled materials is necessary. Such initiatives could help offset the high internal costs and reduce the current dependency on export markets. This implies a strategic need for policies that actively attract and support on-island recycling businesses, potentially through targeted subsidies or tax incentives, to foster a more resilient and self-sufficient local waste economy. Without such measures, the state will continue to face an uphill battle in consistently meeting its ambitious waste reduction targets.

11.2 Key Features

Solid Waste Management Practices

Hawai‘i’s approach to solid waste management is guided by a statutory hierarchy, emphasizing waste prevention and resource recovery.

Source Reduction

As the highest priority in the state’s waste management hierarchy, source reduction is defined by HRS Chapter 342G-1 as the design, manufacture, and use of materials to minimize both the quantity and toxicity of waste produced.²⁹² This also encompasses efforts to reduce waste creation through product redesign or by fundamentally altering societal consumption patterns. While conceptually the most impactful strategy for waste prevention, quantifying source reduction remains inherently difficult. Its effectiveness is often assessed through estimates rather than precise measurements, as it involves reducing waste that is never generated in the first place either because of product redesign or through the reduced consumption of products by the public.

Recycling (including Bioconversion)

Recycling is statutorily defined as "the collection, separation, recovery, and sale or reuse of secondary resources that would otherwise be disposed of as municipal solid waste, and is an integral part of a manufacturing process aimed at producing a marketable product made of postconsumer material".²⁹³ This process of collecting and reprocessing materials into new products is the most easily quantifiable waste diversion activity, with data regularly collected from recycling facilities by both the State and counties.²⁹⁴ Bioconversion, primarily exemplified in Hawai‘i by the composting of green waste such as tree trimmings and grass clippings, is considered a recycling activity and its reported weights are included within overall recycling figures.

²⁹² Wastewater Branch - Hawai‘i State Department of Health

²⁹³ Wastewater Branch - Hawai‘i State Department of Health

²⁹⁴ Wastewater Branch - Hawai‘i State Department of Health

Reuse

Although not explicitly identified as a statutory priority within the waste management hierarchy, the OSWM actively promotes reuse activities.²⁹⁵ Reuse involves utilizing a product again without the need for reprocessing, whether for its original purpose or a different application. Similar to source reduction, quantifying reuse is challenging and often impractical. This is due to its widespread and unregulated nature, as it occurs at many levels, from individuals reusing plastic food containers or glass jars to larger-scale material exchanges. The difficulty in measuring these activities means that their contribution to overall waste reduction and environmental benefits may not be fully captured in official statistics.

The inherent difficulty in quantifying source reduction and reuse, despite their high priority in Hawai‘i’s waste management hierarchy, presents a notable challenge for comprehensive climate action reporting. While recycling rates are readily measurable and often the focus of public reporting and policy, the true impact of the state’s efforts in preventing waste at its origin may be significantly understated. For future reporting, Hawai‘i could explore innovative proxy metrics or qualitative indicators for source reduction and reuse activities to better convey their environmental benefits, even in the absence of direct quantification. This might involve tracking the implementation of relevant policies (e.g., plastic bans), public participation rates in reuse initiatives, or shifts in industry practices towards reduced packaging.

Wastewater Management Practices

The Hawai‘i Department of Health’s Wastewater Branch is responsible for protecting public health and the environment through the administration of statewide engineering functions related to water pollution control.²⁹⁶ Its purview includes municipal and private wastewater treatment works, individual wastewater systems, and the management of the Clean Water State Revolving Fund. A key area of focus for the branch is addressing cesspool conversion, which are noted for merely disposing of wastewater rather than treating it, posing significant environmental and public health risks.

The Wastewater Branch also manages a Recycled Water Program, which is increasingly vital given Hawai‘i’s growing population and limited potable water resources.²⁹⁷ This program recognizes the importance of treated domestic wastewater for reuse applications, addressing critical water scarcity issues that are exacerbated by climate change.

Cesspools

About 83,000 residential cesspools still operate statewide, discharging around 50 million gallons of raw sewage every day (mgd) to groundwater, streams and coastal reefs.²⁹⁸ All cesspools are now legally classified as sub-standard systems that endanger public health and marine ecosystems. Beyond nutrient and pathogen loading, anaerobic sewage decomposition inside cesspools releases methane (CH₄) and nitrous oxide (N₂O), two potent greenhouse-gases. Eliminating all cesspools

²⁹⁵ Ibid.

²⁹⁶ Ibid.

²⁹⁷ Ibid.

²⁹⁸ Cesspool Conversion Working Group Final Report (2023), https://health.hawaii.gov/wastewater/files/2022/11/ccwg_final_report.pdf

would remove one of the state’s largest diffuse CH₄ sources and advance Hawai‘i’s 2045 carbon-neutral goal. Act 125 (2017) has as its goal to convert all cesspools by 2050.²⁹⁹ Yet replacement costs range from \$880 million to \$5.3 billion, an average around \$23,000 per home. At that price 97% of cesspool households would pay more than 2% of annual income; even a hypothetical \$10,000 rebate still leaves significant cost-burden. Counties and DOH currently lack the engineering, permitting, outreach and loan-servicing staff needed to process thousands of upgrades per year. Existing federal and state loan and grant channels generally fund public entities, not individual homeowners. Programs that do support owners require them to pre-pay and wait for reimbursement.³⁰⁰ By coupling an accelerated conversion schedule with layered financing, Hawai‘i can simultaneously protect drinking water, revive coral reefs and achieve a measurable slice of its statewide greenhouse-gas reduction commitment.

Accelerate replacement of cesspools and outdated septic systems with nature-based systems, cluster systems, or other modern treatments to protect water quality and reduce contamination during flooding is proposed here as a Waste Diversion measure.

Category	Metric/Item	Value/Description
Cesspool Distribution	Hawai‘i Island	48,596
	Kaua‘i	14,300
	Maui	11,038
	O‘ahu	7,491
	Moloka‘i	1,400
Wastewater Load	Statewide Total Effluent	49.9 mgd
	Hawai‘i Island Contribution	~30 mgd
GHG Footprint	Emission Per Cesspool	0.34 metric tons CO ₂ -e (CH ₄)/year
	Statewide Avoidance Potential	~28,000 t CO ₂ -e/year
	Equivalent Car Reduction	~6,000 cars
Unit Costs	Low-complexity (Septic + Leach)	~\$10,000
	Advanced (Aerobic/UV + Seepage)	Up to \$60,000
	Median Modeled Monthly Cost	~\$210
Financing	Unfunded Gap (after loans, grants, and \$10k rebates)	At least \$1.1 Billion from a total cost of \$5 Billion.

Table 68: Cesspools in Numbers ³⁰¹

²⁹⁹ Ibid.

³⁰⁰ Ibid.

³⁰¹ Ibid.

11.3 Numbers and Targets: Current Status and Future Goals

On O‘ahu, emissions from waste and wastewater disposal and management contribute approximately 3% and 0.2% of the island's total GHG emissions, respectively.³⁰² While these percentages may appear modest, emissions in this sector are predominantly methane (CH4) and nitrous oxide (N2O), both high global warming potential (GWP) greenhouse gases.³⁰³ Another factor is the significant diversion of waste to H-POWER for electricity generation. H-POWER functions as a waste-to-energy facility, capable of processing 730,000 -750,000 tons of trash annually, supplying approximately 10% of O‘ahu's electricity needs, or 70 megawatts of power, sufficient for about 60,000 homes.³⁰⁴

Waste Sources	2022
	MMTCO2Eq
Landfills	0.32
Wastewater Treatment	0.05
Composting	0.03
Total Emissions	0.40
Non-Waste Emissions	19.9

Table 69: Hawai‘i GHG Emissions in Waste Sector 2022 (MMT CO2 Eq.), figures taken from Hawai‘i Energy Office, Hawai‘i Pathways to Decarbonization.

The majority of waste stream GHG emissions on O‘ahu originate from H-POWER which is considered less GHG-intensive than direct fossil-fuel burning or traditional landfilling. Projections indicate that GHG emissions from landfills are expected to decline, while emissions from composting and wastewater treatment are anticipated to increase slightly, based on assumptions related to population growth.³⁰⁵ Beyond direct emissions within the state, Hawai‘i’s waste stream reduction efforts contribute to a broader reduction in global GHG emissions, underscoring the interconnected nature of climate pollution.

In Fiscal Year 2024, the State of Hawai‘i achieved a total waste diversion rate of 26.5%, with 664,213 tons diverted out of a total of 2,510,180 tons generated.³⁰⁶ When the tonnage from incineration, specifically from Honolulu's H-POWER facility, is included, the combined diversion and incineration rate for the State rises to 52.1%.³⁰⁷

³⁰² One Climate One O‘ahu Climate Action Plan 2020-2025, accessed June 10, 2025, <https://alohachallenge.hawaii.gov/pages/spotlight-one-climate-one-oahu-climate-action-plan>

³⁰³ HSEO. (2023) Decarboization

³⁰⁴ City and County of Honolulu, Department of Environmental Services, <https://www.honolulu.gov/env/h-power-continues-to-record-high-landfill-diversion-rates/>

³⁰⁵ One Climate One O‘ahu Climate Action Plan 2020-2025, accessed June 10, 2025, <https://alohachallenge.hawaii.gov/pages/spotlight-one-climate-one-oahu-climate-action-plan>

³⁰⁶ Office Of Solid Waste Management Annual Report to the Thirty-third Legislature State Of Hawai‘i, accessed November 30, 2025, <https://health.hawaii.gov/opppd/files/2025/09/2025-OSWM-LEGISLATIVE-REPORT.pdf>

³⁰⁷ Ibid.

The following table provides a clear, concise summary of current waste management performance across all counties and the state. By including both "Diversion Rate" and "Diversion + Incineration Rate," it acknowledges the specific role of waste-to-energy (H-POWER) in Honolulu, which significantly impacts overall waste management but is not strictly "recycling" by state definition.

County	Total Waste Generated (tons)	Total Waste Diverted (tons)	Diversion Rate	Incinerated (tons)	Diversion & + Incineration Rate
Hawai‘i County	324,495	105,708	32.6%	N/A	32.6%
Maui County	373,778	59,935	16 %	N/A	16 %
Honolulu County	1,691,009	467,856	27.7%	644,266	65.8%
Kaua‘i County	120,898	30,714	25.4%	N/A	25.4%
State Total	2,510,180	664,213	26.5%	644,266	52.1%

Table 70: State Solid Waste Diversion and Diversion + Incineration Rates (FY2024)

State-Level Targets

The State Legislature had initially set an ambitious waste diversion goal of 25% by 1995, which was subsequently increased to 50% by 2000.³⁰⁸ Both of these targets are met, with the percentage of waste diversion for the state staying around the 25% mark and rising to a total of 50% if incinerated waste is included. Proposals to amendment to HRS Chapter 342G-003 to expand the State's waste diversion goal to 70% by 2035 has been proposed and is supported by DOH but has not yet been passed.

Honolulu County Targets

The City and County of Honolulu's 2020-2025 Climate Action Plan (CAP) outlines a strategy to reduce Greenhouse Gas (GHG) emissions by 45% over the next five years and to achieve carbon neutrality by 2045.³⁰⁹ The waste sector is one of the key areas targeted for these reductions. The City's 2019 Integrated Solid Waste Management Plan (ISWMP) established a goal of 25% per capita waste reduction by 2030, with the primary implications of this goal being realized through H-POWER operations.³¹⁰ Projections indicate that waste sector GHG emissions for O‘ahu are estimated to be approximately 0.15 MMTCO2 Eq. in 2045 and .20 MMTCO2 Eq in 2030), representing a 66% reduction from 2015 levels.³¹¹ The city anticipates continued increases in landfill diversion through enhanced public participation in recycling and optimized H-POWER operations in 2024 and 2025.³¹² For the City and County are also exploring options to extending the O‘ahu Island "Transfer Station Reusable Material Collection Site" to support waste diversion.

³⁰⁸ Office of Solid Waste Management Annual Report to the thirty-second Legislature State of Hawai‘i, accessed June 10, 2025, https://health.hawaii.gov/opppd/files/2024/03/27_2024-OSWM-Legislative-Report.pdf

³⁰⁹ Climate Action Plan — Resilience Office - City and County of Honolulu Office of Climate Change, Sustainability and Resiliency, accessed June 10, 2025, <https://www.resilientoahu.org/climate-action-plan>

³¹⁰ Ibid.

³¹¹ City and County of Honolulu Climate Action Plan 2020 - 2025, <https://static1.squarespace.com/static/5e3885654a153a6ef84e6c9c/t/5fed27185abd827cad03a859/1609377638945/Clim+Action+Plan.pdf>

³¹² Res Rates and Data | Department of Environmental Services, accessed June 10, 2025, <https://www8.honolulu.gov/env/ref/res-rates-and-data/>

Kaua‘i County Targets

Kaua‘i County's 2011 Zero Waste Resolution and its 2018 General Plan established a 70% waste diversion goal by 2023.³¹³ Waste diversion is an increasingly pressing issue for Kaua‘i as their Kekaha landfill is approaching maximum capacity and a new site has not been identified.

Maui County Targets

Maui County's 2009 Integrated Solid Waste Management Plan (ISWMP) set a goal of 60% waste diversion from its landfills.³¹⁴ Efforts to achieve this objective, including increased recycling and the utilization of WasteTEC (waste-to-energy) technology, are projected to extend the capacity of the Central Maui Landfill until 2042.

A significant gap exists between Hawai‘i’s ambitious waste diversion targets and current performance across most counties. While clear goals are established, achieving them necessitates substantial systemic changes, including adequate funding, robust infrastructure development, sufficient staffing, and strong legislative support. The current diversion rates suggest that the state is not on track to meet its proposed 2030 goals without accelerated and concerted efforts. It is essential to candidly address these performance gaps and outline specific, funded initiatives and policy changes required to bridge the difference between current rates and future targets. This may involve advocating for stronger state-level mandates, increased county funding, and expanded public-private partnerships to scale up recycling and bioconversion infrastructure.

11.4 Challenges and Innovations

Economic and Geographic Constraints

The state’s small population and limited local economy mean that nearly all recyclable materials must be shipped to processing facilities on the continent or in Asia. This dependence on external markets exposes Hawai‘i to significant volatility in global recycled materials markets. For instance, the 2018 ban on most recyclable plastics by China had a disproportionate impact on Hawai‘i’s recyclers, who already operate with thinner profit margins due to high land values, labor costs, utilities, and specialized equipment expenses.³¹⁵ This reliance on external markets means that when the economics of export become unfavorable, local recycling infrastructure and programs suffer, as evidenced by redemption center closures on Hawai‘i Island. This highlights a fundamental weakness in achieving consistent waste diversion, as the current market-driven approach creates inherent instability for the state’s efforts.

Landfill Capacity Crisis

A critical and immediate challenge across several counties is the looming shortage of landfill capacity. The Kekaha Landfill on Kaua‘i is projected to reach its capacity by June 2027, or

³¹³ Kaua‘i Integrated Solid Waste Management Plan - Kauai.gov, accessed June 10, 2025, https://www.kauai.gov/files/assets/public/v/1/public-works/documents/proof-v2_kauaico_iswmp_update_draft5_final-211103.pdf

³¹⁴ Integrated Solid Waste Management Overview - Maui County, accessed June 10, 2025, <https://www.mauicounty.gov/DocumentCenter/View/4502/Overview-of-final-ISWMP?bidId=>

³¹⁵ Office of Solid Waste Management Annual Report to the thirty-second Legislature State of Hawai‘i, accessed June 10, 2025, https://health.hawaii.gov/opppd/files/2024/03/27_2024-OSWM-Legislative-Report.pdf

November 2030 with a vertical expansion.³¹⁶ Similarly, the Central Maui Landfill’s capacity is projected to be reached by 2026.³¹⁷ On O’ahu, the Waimanalo Gulch Sanitary Landfill (WGSL), the city's only active municipal solid waste landfill, is mandated to cease operations by March 2, 2028.³¹⁸ The process of siting, permitting, and constructing new landfills typically requires approximately 10 years, creating a severe timeline challenge for the state. This impending landfill crisis is not merely a waste disposal problem but a direct impetus for accelerating waste diversion efforts and exploring alternative technologies.

Program-Specific Operational Issues

The Deposit Beverage Container (DBC) Program has experienced a declining redemption rate, falling from 63.08% in FY2021 to 54.82% in FY2024.³¹⁹,³²⁰ This decline is partly attributed to macroeconomic issues and, more recently, to the closure of redemption centers on Hawai‘i Island due to labor shortages and a lack of bids for county subsidies. Additionally, the current “segregated rate” used for counting containers, which was developed in 2007 based on thicker plastic carbonated beverage containers, negatively impacts the reported redemption rate as consumer trends have shifted to thinner, lighter plastic water bottles that weigh less per container.³²¹ Despite the significant challenges, Hawai‘i is actively pursuing various innovations and strategic approaches to enhance its waste management sector and achieve climate goals.

Integrated Planning

A key strategic approach is the ongoing update to the 2000 State Integrated Solid Waste Management (ISWM) Plan. This update, being led by the OSWM and Tetra Tech BAS, Inc., involves a dedicated Task Force comprising diverse stakeholders from county government, solid waste management and recycling businesses, and environmental groups.³²² This comprehensive planning effort aims to identify and implement solutions for a wide array of waste streams, including tires, batteries, photovoltaic panels, organic waste, construction waste, packaging, carpet, and mattresses. This modernized approach signals a strong commitment to improving the state’s waste management infrastructure and practices.

Policy and Regulatory Refinements

Legislative actions are playing a crucial role in strengthening waste management programs. Most recently Act 103 (2025) has provided funding to the DOH to conduct a statewide needs assessment and establish an advisory council to determine what would be needed to transition to a more

³¹⁶ Kaua‘i Integrated Solid Waste Management Plan - Kauai.gov, accessed June 10, 2025, https://www.kauai.gov/files/assets/public/v/1/public-works/documents/proof-v2_kauaico_iswmp_update_draft5_final-211103.pdf

³¹⁷ Maui Island Plan 07-28-2014, accessed June 10, 2025, <https://mauicounty.legistar.com/View.ashx?M=F&ID=4804406&GUID=8F903AE3-41A3-4521-B7A6-91CCACE7C106>

³¹⁸ New Landfill Siting | Department of Environmental Services - Honolulu.gov, accessed June 10, 2025, <https://www.honolulu.gov/env/ref/new-landfill-siting/>

³¹⁹ Office of Solid Waste Management Annual Report to the thirty-second Legislature State of Hawai‘i, accessed June 10, 2025, https://health.hawaii.gov/opppd/files/2024/03/27_2024-OSWM-Legislative-Report.pdf

³²⁰ Office Of Solid Waste Management Annual Report to the Thirty-third Legislature State Of Hawai‘i, accessed November 30, 2025, <https://health.hawaii.gov/opppd/files/2025/09/2025-OSWM-LEGISLATIVE-REPORT.pdf>

³²¹ OSWM Annual Report to the thirty-second Legislature State of Hawai‘i,

³²² Ibid.

circular system with less waste generation and more reuse, and the necessary infrastructure to sort and locally process recyclable materials through an extended producer responsibility program for packaging materials and paper products.³²³ Other legislative acts are focused on the regulation of waste reduction such as Act 012 (2022) for the Deposit Beverage Container Program aims to improve accountability by ensuring distributors properly account for imported or manufactured containers, addressing previous audit findings and revenue discrepancies.³²⁴

Act 151 (2022) concerning Electronic Device Recycling and Recovery requires manufacturers to fully fund their recycling programs, covering collection, transportation to certified mainland recyclers, and the actual recycling processes. The act also established a 50% recycling goal for manufacturers, based on sales from two years prior, with a \$1.50 per pound penalty for non-compliance, aiming to significantly increase electronics recycling rates.³²⁵ Act 162 expands the types of electronic devices subject to the Electronic Device Recycling and Recovery Act.³²⁶ The Act allows, rather than requires, DOH to determine additional penalties, requires manufacturers' recycling plans to describe communication efforts with the State and counties to facilitate consumer education efforts, establishes additional manufacturer recycling goals beginning on 1/1/2026 and 1/1/2027.

Waste-to-Energy and Resource Recovery

Efforts are continuously underway to optimize H-POWER's contribution by redirecting additional waste streams, such as sewage sludge, bulky waste, auto shredder residue, and wastewater treatment plant screenings, from landfills to the facility.³²⁷ Furthermore, the city is actively pursuing initiatives to reuse H-POWER ash and residue, maximizing resource utilization and further minimizing reliance on landfills.

11.5 County-Level Innovations

Individual counties are also implementing innovative programs tailored to their specific needs. To reduce plastic waste, the Kaua'i County Council adopted a plastic bag reduction ordinance in 2009, requiring businesses to provide only recyclable paper or reusable checkout bags. In 2020, Mayor Derek Kawakami signed Bill 2775 banning foam polystyrene food service ware. The County also adopted a policy, effective January 2021, prohibiting the purchase, use, or distribution of single-use plastics with County funds, at County events, by employees, or facility users.

³²³ https://www.capitol.hawaii.gov/sessions/session2025/bills/GM1203_.PDF

³²⁴ Ibid.

³²⁵ ACT 151 (2022), The Hawai'i Electronic Device Recycling and Recovery Law, <https://health.hawaii.gov/ewaste/files/2022/07/act151.pdf>

³²⁶ ACT 162 (2025), The Hawai'i Electronic Device Recycling and Recovery Law, https://health.hawaii.gov/ewaste/files/2025/06/GM1262_-ACT-162.pdf

³²⁷ Future Plans | Department of Environmental Services - Honolulu.gov, accessed June 10, 2025, <https://www8.honolulu.gov/env/ref/future-plans/>

Kaua‘i County’s “Pay As You Throw” (PAYT) program incentivizes residents to reduce waste by utilizing a volume based rate structure based on cart size.³²⁸ The county has also enacted plastic ordinances and actively promotes green waste diversion through green waste drop off sites at all Refuse Transfer Stations and the Kekaha Landfill, and offering free distribution of Earth Machine home composters to residents. The County supports waste reduction through two grant programs: recycling grants of up to \$40,000 offered by the Department of Public Works, and innovation grants of up to \$50,000 administered by the Office of Economic Development. In addition, the County has established a Compost Infrastructure Working Group to identify feasible, cost-effective composting programs for food residuals and develop an implementation plan for the Solid Waste Division.

Maui County has initiated a Fiscal Year 2026 Recycling Grants Program, offering funding for projects focused on landfill diversion. These projects can include material collection, processing, recycling equipment, and broader waste reduction initiatives.³²⁹

The County of Hawai‘i Department of Environmental Management has implemented a reusable food ware programs under its Administrative Rule 2-10 Relating to Polystyrene Foam Food Container and Food Service Ware Reduction.³³⁰ In addition, in December 2007, the County Council adopted Resolution 356-07 to “embrace and adopt the principles of zero waste as a long-term goal for Hawai‘i County.”³³¹

Honolulu City and County’s Disposable Food Ware Ordinance (Ordinance 19-30) phases out single-use polystyrene and plastic service ware, directly promoting source reduction and mitigating plastic pollution.³³² Their Source Reduction Working Group (SRWG) exemplifies a collaborative innovation. This group actively engages with diverse stakeholders to identify effective source reduction strategies, with a focus on critical topics such as construction and demolition (C&D) waste, product packaging, food waste/organics, and solar photovoltaic (PV) panel waste.³³³

³²⁸ Kaua‘i Integrated Solid Waste Management Plan - Kauai.gov, accessed June 10, 2025,

https://www.kauai.gov/files/assets/public/v/1/public-works/documents/proof-v2_kauaico_iswmp_update_draft5_final-211103.pdf

³²⁹ Applicants invited to County FY26 Recycling Grants Program information session May 7, accessed June 10, 2025, <http://www.mauinuistrong.info/news/applicants-invited-to-county-fy26-recycling-grants-program-information-session-may-7>

³³⁰ County of Hawai‘i Department of Environmental Management (2023). Rules of Practice and Procedure, <https://records.hawaiicounty.gov/weblink/1/edoc/122975/23-04-19%20Env%20Mgt%20Rules%20of%20Practice%20and%20Procedure%20-%20Final.pdf>

³³¹ County of Hawai‘i (2019). Integrated Waste Solid Waste Management Plan Update, https://records.hawaiicounty.gov/weblink/1/edoc/120882/County_of_Hawaii_Integrated_Solid_Waste_Management_Plan_2019_Update_Final.pdf

³³² Waste - Resilience Office - City and County of Honolulu Office of Climate Change, Sustainability and Resiliency, accessed June 10, 2025, <https://www.resilientoahu.org/waste>

³³³ Source Reduction | Department of Environmental Services - Honolulu.gov, accessed June 10, 2025, <https://www8.honolulu.gov/env/ref/source-reduction/>

To build resilience and ensure consistent progress towards climate goals, Hawai‘i may need to transition towards a more publicly supported or regulated recycling system that is less susceptible to global market forces. This could involve direct government investment in local processing facilities, guaranteed minimum prices for recycled materials, or stronger Extended Producer Responsibility (EPR) laws that internalize the costs of recycling within product pricing, thereby stabilizing the local recycling economy. Funding that supports significant increases in diversion infrastructure such as these directly addresses both the immediate waste crisis and long-term GHG reduction targets. Policies that incentivize diversion are no longer merely environmental preferences but have become economic and logistical necessities for the state.

11.6 Measure Description and GHG reduction

Measure: Waste Diversion

This measure combines complying with State targets of diverting 70% of solid waste from landfill disposal by 2030 and 90% by 2045. The goal includes intention to reduce the waste stream by avoiding the generation of waste products in the first place (source reduction), reusing or recycling and composting. Emission reductions from recycling paper and cardboard were modeled since they are organic materials that emit in anerobic circumstances in landfills and are not included in the organic materials composting that are covered in a separate action. In 2024, 26.4% of the total waste stream was diverted, indicating significant efforts are needed to reach the goals.

In order to implement this measure, infrastructure investments in regional material recovery hubs are required, including advanced sorting facilities, remanufacturing centers, and repair and reuse marketplaces. The O‘ahu Island “Transfer Station Reusable Material Collection Site” expansion project is considered relevant to facilitate implementation of this measure.

Other supporting measures include improved legislation limiting single-use plastic products, clarifying recyclable item manufacturer labeling requirements and delivering additional recycling awareness campaigns.

Measure: Composting

Diversion of organic waste enables the production of local compost and diverts certain materials from the state’s waste streams. Local composting opportunities have expanded with Act 131 (2022) to allow composting in agricultural districts and provide capacity to help eliminate permitting barriers for small-scale compost operations. Composting targets are set to reach a diversion rate of 70% by 2030 and 90% by 2045. This will be achieved through municipal programs and decentralized, community-based compost networks.

Measure: Waste Reduction

This action reduces the amount of waste produced by packaging materials, supported by legislation that redefines producer accountability for imported goods. A 10% reduction in paper, cardboard and plastic waste is targeted by avoiding its existence in the first place. There are several programs to promote waste generation avoidance, such as installing dishwashers and mobile washing

stations to reduce food waste and reliance on single-use materials in schools like disposable plates, containers and utensils, as well as reusing and refilling programs for food and beverage packaging (collection, washing, and logistics infrastructure to support the circulation of reusable items) as well as Extended Producer Responsibility legislation.

Emissions Reductions

Assumptions:

- 70% of paper waste can be diverted from landfill by 2030 and 90% by 2045, modeled with linear growth from 2021 to 2045.
- Composting rates were modeled as a linear increase from 1% in 2021 to 90% in 2045.
- For non-industrial facilities, the model assumed that 0% of compostable waste would be composted by 2045.
- Honolulu County’s reductions are influenced by the H-POWER waste-to-energy facility, which reduces landfill disposal.
- Quantities of waste were projected using the ratio of future projected population to current population, applied to total waste estimates.

Emission reductions from waste actions are detailed in the following table.

MMT CO2e	2026	2030	2035	2040	2045	Cumulative 2026-2045
Waste diversion	-0.08	-0.17	-0.19	-0.20	-0.22	-3.6
Composting	-0.10	-0.15	-0.17	-0.18	-0.19	-3.3
Waste reduction	-0.002	-0.005	-0.010	-0.012	-0.010	-0.18

Table 71: Emissions Reductions from 90% Waste Diversion, 90 % Composting, and 10% Waste Reduction Actions by 2045, Across the State, in Milestone Years.

The following table presents the county-level data, highlighting clear differences in scale for waste diversion and composting measures. Honolulu contributes the largest share, accounting for more than half of cumulative reductions statewide, while Maui provides nearly one-third. Hawai‘i County adds about 11%, and Kaua‘i contributes the smallest share at around 6%. These results show that statewide progress is driven primarily by Honolulu and Maui, with smaller counties adding incremental but still meaningful reductions.

MMT CO2e	Measure	2026	2030	2035	2040	2045	Cumulative 2026-2045
Hawai‘i	Waste diversion	-0.01	-0.02	-0.02	-0.02	-0.03	-0.41
	Composting	-0.01	-0.01	-0.01	-0.01	-0.01	-0.19
Honolulu	Waste diversion	-0.05	-0.11	-0.11	-0.12	-0.13	-2.2
	Composting	-0.03	-0.04	-0.05	-0.05	-0.05	-0.88

Kaua‘i	Waste diversion	-0.01	-0.01	-0.01	-0.01	-0.01	-0.14
	Composting	-0.01	-0.01	-0.01	-0.01	-0.01	-0.21
Maui	Waste diversion	-0.01	-0.01	-0.02	0.02	-0.02	-0.30
	Composting	-0.04	-0.06	-0.07	-0.07	-0.08	-1.28
Total		-0.17	-0.27	-0.3	-0.27	-0.34	-5.61

Table 72: Emissions Reductions from 90% Waste Diversion and 90% Composting Actions by 2045, by County, in Milestone Years.

The following figure illustrates projected emissions reductions from diverting paper waste under three scenarios: no action, 40% reduction, and 90% reduction by 2045. The chart shows that a 90% diversion rate reduces emissions from roughly 0.25 MMTCO₂e in 2045 under no action to about 0.05 MMTCO₂e, achieving a cumulative reduction of approximately 4.7 MMTCO₂e by 2045.

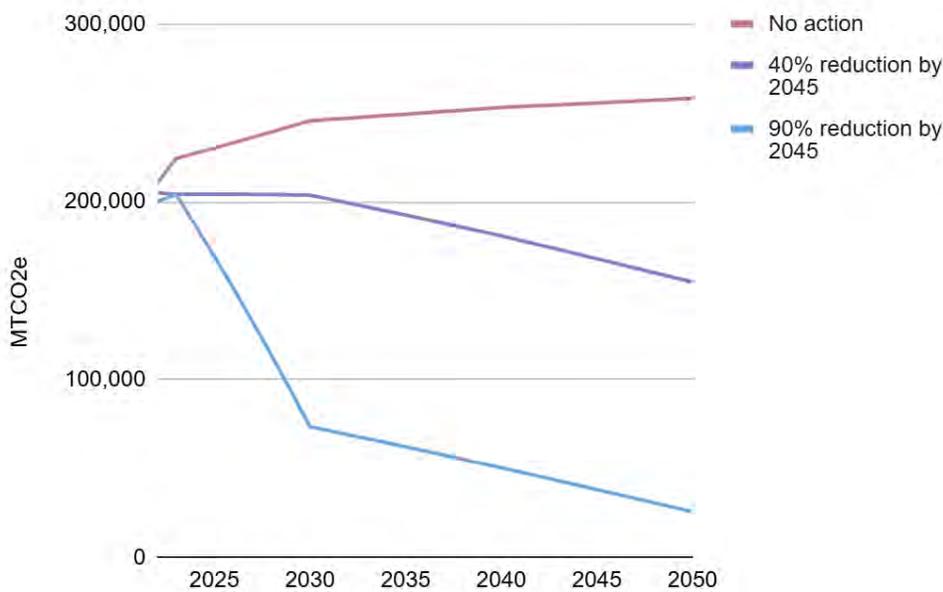


Figure 44: Projected emissions from paper waste under “No action,” “40% reduction,” and “90% reduction” scenarios (MTCO₂e).

The following figure shows projected waste sector emissions under two scenarios: with no action, emissions rise steadily to nearly 180,000 MTCO₂e by 2045. In contrast, diverting 90% of organic waste results in sharp avoided emissions. It is important to note that composting emission reductions include the avoided landfill emissions and offsets due to increase in soil carbon storage and avoiding the use of synthetic fertilizer. These reductions are included in this sector, which is why reductions are higher than the baseline, reaching negative numbers after 2037.

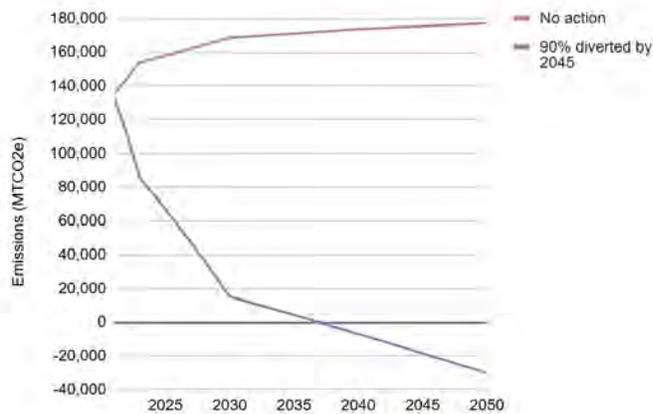


Figure 45: Projected emissions from organic waste under “No action” and “90% diverted by 2045” scenarios.

Co-Pollutant Reductions

There are no co-pollutant changes anticipated with waste diversion measures as it is assumed no air pollutants are associated with waste treatment.

11.7 Key implementing agency (or agencies)

State Level: Regulatory & Oversight Authority

The State of Hawai‘i establishes standards, issues permit, and monitors compliance for waste management facilities to ensure environmental protection and public health.

Hawai‘i Department of Health (DOH)

- **Solid and Hazardous Waste Branch (SHWB), Office of Solid Waste Management (OSWM):** The primary regulatory authority for solid waste. This branch issues permits for landfills, composting facilities, recycling centers, and waste-to-energy plants. It enforces state laws regarding waste diversion, deposit beverage containers (HI-5), and hazardous waste management. The OSWM is tasked with providing annual reports to the Hawai‘i State Legislature, detailing the progress made toward the state’s waste reduction objectives.
- **Wastewater Branch:** Regulates wastewater systems, including municipal treatment plants, private wastewater systems, and cesspool conversion mandates.

Hawai‘i State Energy Office (HSEO) serves as a key partner in "Waste-to-Energy" initiatives and policy development regarding the intersection of waste management and renewable energy goals.

Hawai‘i Department of Agriculture and Biosecurity (DABS) Under Hawai‘i Revised Statute §141-16 DABS is responsible for the Compost reimbursement program to provide cost reimbursements to farming operations and landscaping operations in the State for the purchase of compost.

County Level: Implementation & Operational Agencies

Each county is responsible for the physical implementation of waste management, including curbside collection, landfill operation, recycling programs, and wastewater treatment within their jurisdiction.

City and County of Honolulu

- **Department of Environmental Services (ENV):**
 - **Refuse Division:** Manages the collection and disposal of solid waste, including the H-POWER waste-to-energy facility, municipal landfills (e.g., Waimānalo Gulch), and island-wide recycling programs.
 - **Wastewater Engineering & Construction / Treatment & Disposal Divisions:** Operates and maintains the municipal wastewater collection and treatment systems.

County of Hawai‘i

- **Department of Environmental Management (DEM):**
 - **Solid Waste Division:** Oversees the county’s landfills (e.g., West Hawai‘i Sanitary Landfill), transfer stations, and zero-waste initiatives.
 - **Wastewater Division:** Manages county sewer systems and wastewater treatment facilities.

County of Maui (Maui, Moloka‘i, Lāna‘i)

- **Department of Environmental Management (DEM):**
 - **Solid Waste Division:** Responsible for residential refuse collection, landfill management (e.g., Central Maui Landfill), and landfill diversion programs across the three islands.
 - **Wastewater Reclamation Division:** Manages wastewater reclamation facilities and water reuse programs.

County of Kaua‘i

- **Department of Public Works (DPW):**
 - **Solid Waste Division:** Manages the Kekaha Landfill, refuse transfer stations, curbside collection, and the Kaua‘i Resource Center.
 - **Wastewater Management Division:** Operates and maintains the county’s wastewater collection and treatment infrastructure.

11.8 Implementation schedule and milestones and Metrics for tracking progress

WASTE		
1. WASTE DIVERSION	2026: Plan enhancements and expansions to waste collection and diversion services. Increase diversion of total waste by 10% every 5 years. Waste being diverted from final disposal or treatment to reach: - 70% by 2030	Tons of recycled and composted materials/tons of solid waste generated

	- 90% by 2045	
2. COMPOSTING	Starting with 34% of composting in 2023, the organic fraction being composted reaches: - 70% by 2030 - 90% by 2045	Quantity of organic waste going to composting plants. Number of composting plants and capacity.
3. AVOIDING WASTE GENERATION	10% reduction in waste generation by 2040.	Per capita waste generation rates.

Table 73: Waste Management Sector Implementation Schedule and Milestones

11.9 Cost Estimates for Implementation

Implementing waste actions would cost in total \$101.4 million USD. These costs were estimated using funding referenced in the PCAP, assuming \$195 per ton of waste being diverted and composted. This calculation does not include savings from solid waste final disposition in landfills nor does it take into account of the market potential of the green waste once processed as compost. The table below shows how these costs are distributed across the state and counties, with Honolulu County accounting for the largest share due to its higher waste volumes.

\$ millions	Total State	Hawai'i County	Honolulu City & County	Maui County	Kaua'i Conty
Waste diversion	55	6.6	33.2	4.9	2.3
Composting	46.4	2.8	12.0	20.0	3.3

Table 74: Cumulative NPV cost estimates for implementing waste diversion and composting measures, 2026–2045.

11.10 Funding source

The funding pool for waste and materials management is primarily composed of county level user fees, state administered disposal fees and federal grant funding sources, with some private funds available for recycling and waste reduction programs. Historically Hawai'i has received EPA funds for recycling and waste management infrastructure, and again with federal funding changes the amount of future funding remains unclear. As there are few private funders focused on waste and material management, user fees may increase to account for federal cuts.

Federal Funds

The U.S. Environmental Protection Agency Solid Waste Infrastructure for Recycling program offers grants to support improved recycling and waste management systems, which can help Hawai'i reduce landfill emissions, increase diversion of waste materials, and build a circular

economy. Under the current SWIFR round, funding spans \$100,000 to \$1,500,000 per award, with a total estimated funding pool of about \$20 million for eligible applicants.³³⁴

The USDA Rural Development Solid Waste Management Grants program provides funding to support improved solid waste planning and management in rural communities, benefiting Hawai'i's smaller communities seeking to reduce pollution and enhance resilience. In the current round for fiscal year 2026, the national pool is about \$4,000,000, with individual grants available up to \$1,000,000 for eligible projects focused on technical assistance, landfill site evaluation, waste reduction planning, or closed site reuse planning.³³⁵

U.S. Department of Agriculture Rural Development Solid Waste Management Grants in Hawai'i and Western Pacific program helps rural communities in Hawai'i and the Western Pacific improve waste planning, reduce pollution, and support landfill management and waste-reduction training. For fiscal year 2026, the national funding pool is about \$4,000,000, with individual grants up to \$1,000,000.³³⁶

State Funds

The Hawai'i Department of Agriculture Plant Industry Division Compost Reimbursement Program helps Hawai'i farmers, ranchers, and landscapers offset the cost of purchasing compost, including transport, supporting soil health, carbon capture, and climate resilient agriculture. For fiscal year 2026, the program is funded at \$400,000 statewide, reimburses up to 50 percent of qualified compost costs, and pays out up to \$50,000 per eligible applicant.³³⁷

The Water and Wastewater Funding Sources list compiled by the Environmental Finance Center Network offers Hawai'i communities a broad menu of grants, low interest loans, and technical assistance programs designed to improve water infrastructure resilience, wastewater treatment, flood and stormwater management, and water reuse systems. Through these sources, projects may tap into federal and state funds via programs such as drinking water and clean water revolving funds, drought response grants, water efficiency incentives, wastewater upgrades, and watershed

³³⁴ Environmental Protection Agency Solid Waste Infrastructure for Recycling (SWIFR) Grants for Tribes and Intertribal Consortia, accessed December 5, 2025, <https://www.epa.gov/circulareconomy/solid-waste-infrastructure-recycling-grants-tribes-and-intertribal-consortia>

³³⁵ U.S. Department of Agriculture Rural Development Solid Waste Management Grants, accessed December 5, 2025, <https://www.rd.usda.gov/programs-services/water-environmental-programs/solid-waste-management-grants>

³³⁶ U.S. Department of Agriculture Rural Development Solid Waste Management Grants in Hawai'i and Western Pacific, accessed December 5, 2025, <https://www.rd.usda.gov/programs-services/water-environmental-programs/solid-waste-management-grants/hi#:~:text=Program%20Status:,provide%20technical%20assistance%20or%20training>

³³⁷ State of Hawai'i Plant Industry Division Compost Reimbursement, accessed December 5, 2025, [https://dab.Hawai'i.gov/pi/main/compost-reimbursement2025/#:~:text=The%20program's%20details%20are:%20*%20**Funding**%20\\$400%2C000,Department%20of%20Health%20Solid%20Waste%20Management%20Program](https://dab.Hawai'i.gov/pi/main/compost-reimbursement2025/#:~:text=The%20program's%20details%20are:%20*%20**Funding**%20$400%2C000,Department%20of%20Health%20Solid%20Waste%20Management%20Program)

restoration, offering potential funding in the hundreds of thousands to several million dollars per project depending on scope and eligibility.³³⁸

County Funds

The Waiwai Grants-in-Aid program from the County of Hawai‘i can be used for waste and materials-management projects including recycling, composting, and diversion efforts led by qualifying nonprofits. Individual grants are typically capped at about \$50,000 per application.³³⁹

The County of Kaua‘i Solid Waste Division offers a Recycling & Waste Diversion Grant program that provides up to \$40,000 in funding for 501(c)(3) nonprofits working on recycling, waste-diversion, food-waste composting, and other waste-management or reuse initiatives.³⁴⁰

The County of Kaua‘i Innovation Grants program supports waste and materials-management and sustainability projects across Kaua‘i, including initiatives such as composting systems, circular-economy efforts, and waste-reduction. Awards range from \$5,000 to \$50,000, with the total pool for the 2025–2026 cycle capped at approximately \$468,200.³⁴¹

Public-Private & Philanthropic Partnerships

11th Hour Racing: The 11th Hour Racing Clean Technologies and Best Practices program funds community or industry led projects that reduce plastic pollution, promote composting or circular waste solutions, improve water quality, and support sustainable practices in coastal and marine communities. Grants typically range from \$40,000 to \$150,000, with an average award around \$75,000 per project, and funding is tied to specific, measurable projects rather than general operating support.³⁴²

The Leona M. and Harry B. Helmsley Charitable Trust: The Helmsley Charitable Trust Grant supports climate change mitigation in Hawai‘i through large grants for plastic pollution reduction and environmental cleanup. Their grant amounts can range from \$750,000 up to multi-million dollar awards, making them one of the major private funding sources for waste and materials management as well as ocean health projects in Hawai‘i.³⁴³

³³⁸ Hawai‘i Water and Wastewater Funding Sources Compiled by the Environmental Finance Center Network Fall 2024, accessed December 5, 2025, <https://efcnetwork.org/wp-content/uploads/2024/09/Hi-Funding-Table-Fall-2024.pdf>

³³⁹ County of Hawai‘i Waiwai Grants-in-Aid, accessed December 5, 2025, <https://www.Hawai‘i-county.gov/our-county/legislative/county-council/nonprofit-grants>

³⁴⁰ County of Kaua‘i Recycling Grants, accessed December 5, 2025, <https://www.Kaua‘i.gov/Government/Departments-Agencies/Public-Works/Solid-Waste/Recycling/Recycling-Grants>

³⁴¹ County of Kaua‘i Innovation Grants, accessed December 5, 2025, <https://www.Kaua‘i.gov/County-Press-Releases/OED-accepting-proposals-for-Fiscal-Year-2025-2026-Innovation-Grants-2025#:~:text=The%20Office%20of%20Economic%20Development%20is%20now,Tuesday%2C%20September%202%2C%202025%2C%20at%204:00%20p.m..>

³⁴² 11th Hour Racing Clean Technologies and Best Practices, accessed December 5, 2025, <https://11thhourracing.org/clean-technologies-best-practices/>

³⁴³ Helmsley Charitable Trust Grants, accessed December 5, 2025, <https://helmsleytrust.org/our-grants/>



12. Circular and Wellbeing Economy for All

MEASURES

24. CARBON PRICE OF \$150/TON BY 2045

25. ECONOMIC INCENTIVES TO ACCELERATE CIRCULAR INNOVATION

26. MONITORING FRAMEWORK

27. COMMUNITY PARTICIPATION & CONSULTATION

28. EDUCATION & WORKFORCE DEVELOPMENT

12. Circular and Wellbeing Economy for All

12.1 Overview

Hawai‘i and the world are at a crucial juncture of crises and opportunities. The exacerbated impacts of climate change are felt in rising sea levels and temperatures, in increased storms and flooding as well as drought and fire risk, spread of invasive species and vectors for disease. These climate impacts lead to increasing health risks and exacerbate the cost-of-living crisis through rising costs for insurance, food and fuel, which have triggered a troubling exodus of Native Hawaiians from their island home. This needed transition is not merely an environmental imperative but an economic and cultural necessity for Hawai‘i, where the interconnected crises of climate change, socioeconomic inequality, and resource dependency have accelerated loss of local talent and expertise. Hawai‘i has lost a net total of 22,000 residents, approximately 20 people daily, from 2019-2022 and another 4,000 in 2023 alone with many citing unaffordable housing and limited economic opportunities as primary factors.³⁴⁴ This outmigration represents an unprecedented demographic shift with a majority of Native Hawaiians now living outside their ancestral islands. The “brain drain” phenomenon disproportionately affects younger generations, particularly college-educated millennials who find themselves caught in what has been described as “one nasty high-cost-of-living-no-economic-opportunities sandwich”.³⁴⁵ Beyond statistics lies a profound cultural fracturing, as intergenerational family bonds, the foundation of Hawaiian social structures, become stretched across thousands of miles. This separation particularly impacts kūpuna (elders), who lose access to the care and connection traditionally provided by younger family members. Daily economic realities for those who remain reflect a state trapped between paradise and precarity.

At the same time, Hawai‘i’s remote location and history present it with a myriad of unique opportunities for transforming the climate crisis into opportunities for increasing its resilience and self-sufficiency, for caring for the 'āina and transforming the economy to be able to weather the growing impacts of climate change whilst strengthening the capacity of these islands and its community to flourish.³⁴⁶ A profound paradigm shift is needed to put into place any of these opportunities. It is imperative to shift away from the extractive model underpinning the traditional growth-oriented linear and extractive economy to one that is founded on values and practices that emphasize interdependency, reciprocity, and stewardship.

This new paradigm brings together ancestral wisdom and the best of modern knowledge and practices, centers a circular and wellbeing economy. That is, an economy that centers restoration and regeneration of culture and nature, the wellbeing of and solidarity between people, and

³⁴⁴ “The *Hawai‘i We Deserve*: State of Hawai‘i’s Report to the People 2024.” Honolulu, HI: State of Hawai‘i Office of the Governor. Available from: <https://governor.hawaii.gov/wp-content/uploads/2024/03/2024-Green-Admin-Policy-Briefing-Report-1.pdf>

³⁴⁵ Aki, Zuri (2024, January 15). "Stopping Hawaii’s Millennial Brain Drain Is Complicated". Civil Beat. <https://www.civilbeat.org/2019/03/stopping-hawaiis-millennial-brain-drain-is-complicated/>

³⁴⁶ Beamer, K., Elkington, K., Souza, P., Tuma, A., Thorenz, A., Köhler, S., Kukea-Shultz, K., Kotubetey, K., & Winter, K. (2023). Island and Indigenous systems of circularity: How Hawai‘i can inform the development of universal circular economy policy goals. *Ecology and Society*, 28(1), art9. <https://doi.org/10.5751/ES-13656-280109>

circularity of production and consumption to reduce negative impacts and enhance efficiency. A circular and wellbeing economy offers pathways to address these interconnected challenges by reimagining how value is created, distributed, and regenerated within island ecosystems. Rather than treating economic, social, and environmental concerns as separate domains, this model recognizes their fundamental interdependence, much like traditional ahupua‘a³⁴⁷ and looks at affordability, safety, health, housing, food and transportation accessibility and other factors in addition to healthy economies. By localizing production cycles, emphasizing repair and reuse, and prioritizing indigenous practices of resource stewardship, a circular economy could significantly reduce dependence on unstable imports while creating meaningful employment opportunities rooted in place-based knowledge and skills.

Housing crises are addressed through adaptive reuse of existing structures, locally-sourced and renewable building materials, and community land trusts could increase affordability while reducing ecological footprints.³⁴⁸ Circular food systems reduce waste and increase food security by expanding regenerative agriculture which improves self-sufficiency, reduces shipping costs, and creates meaningful employment in a field which also brings cultural connections. Workforce development plays a critical role by investing in circular skills training - from repair technologies to materials innovation - in land conservation, energy and circular entrepreneurship provides career pathways that allow young people to remain in Hawai‘i while participating in its ecological and cultural restoration.

Circular and wellbeing economy projects are already embedded across Hawai‘i’s major sectors, demonstrating that the state is not only conceptually aligned with these frameworks but actively prepared to scale them. Agriculture, renewable energy, natural resource restoration, and waste management initiatives increasingly incorporate circular systems that reduce inputs, extend resource life, and create community-centered benefits. Hawai‘i’s unique geography and long-standing stewardship values position the state to move quickly from pilot projects to broader implementation. Current efforts offer clear proof of concept. Protected bike lanes are popping up on O‘ahu to provide affordable and safe transportation for residents. Ranchers, waste managers, and soil health practitioners are working together to divert cattle mortalities from landfills and convert them into biochar and nutrient-rich soil amendments for local farmers. Re-use Hawai‘i diverts construction waste from landfills and provides low-cost options for those doing renovations. Similar circular models are emerging in reef restoration, regenerative tourism, community-based forestry, and green infrastructure. These examples reflect a statewide readiness: partners are in place, innovation is underway, and communities are eager for projects that regenerate resources, strengthen local economies, and improve collective wellbeing.

³⁴⁷ Ahupua‘a are nested systems for the land and resources management within social-ecological regions in Hawai‘i. See Winter, K. B., Beamer, K., Vaughan, M. B., Friedlander, A. M., Kido, M. H., Whitehead, A. N., ... & Nyberg, B. (2018). The moku system: managing biocultural resources for abundance within social-ecological regions in Hawai‘i. *Sustainability*, (10), 3554.

³⁴⁸ Different models of collective and community ownership keep prices down and create incentives for long-term stewardship.

Reclaiming Regenerative and Equitable Economic Systems

Through reclaiming economic systems based on aloha ‘āina principles, Hawai‘i can address not just symptoms, but root causes of its interconnected crises, creating opportunities for residents to thrive rather than merely survive. In doing so, indigenous knowledge systems and governance are re-prioritized, cultural continuity is strengthened, and measures of prosperity remain grounded in community wellbeing rather than extraction and accumulation.

While contemporary views of prosperity and wealth are often tied to capital and production, a Hawaiian understanding views wealth not as an economic quantity, but as a social ideal rooted in relational health and overall collective well-being.³⁴⁹ Indigenous economies and resource management systems, such as those that once thrived in Hawai‘i, offer early blueprints of circular economy models. The Hawaiian Ancestral Circular Economy (ACE) achieved balance and systemic sustainability through robust institutions that emphasized an equitable distribution of resources. Beamer, Souza, and Elkington describe this system as follows: “Resource and material management within the Hawaiian ACE varied from place to place. Communities worked to ensure that resources were continuously cycled through a process of gathering, distributing, and recycling back into the environment. These practices ensured continuity over decades of management”.³⁵⁰

Key principles of the Hawaiian ACE are: 1) prioritization of relationship-building; 2) balanced governance structures; 3) systematic and regular redistributions of wealth and power; 4) promoting regenerative socio-ecological processes; and 5) environmental kinship.³⁵¹ In the context of the current climate crisis and social inequalities, embracing the ACE framework allows Hawai‘i to shift its relationship to resource use and rebuild self-sufficiency. As we face urgent global challenges, the return toward a circular, wellbeing economy led by Hawaiian ACE principles becomes not only an environmental necessity but also a profound cultural and economic imperative.

Circular and Wellbeing Economy Framework

The circular and wellbeing economy framework is centered in holistic, place-based values and practices that aims to transform Hawai‘i's economic systems to be regenerative, equitable, and aligned with *aloha 'āina*. It combines principles of material and energy circularity with a deep commitment to the principles in the ACE framework, community wellbeing, and solidarity economy practices. Key elements of this definition include:

- ***Aloha 'Āina***: A foundational Hawaiian philosophy grounded in the kinship between people and environment, consisting of core values that include the commitment to act as protectors of land, natural resources, and the overall health of the natural world. This also entails seeking cultural and ecological justice in Hawai‘i and the integration of ancestral knowledge and practices into contemporary social-ecological management efforts.

³⁴⁹ Kanachele, G. H. (1986). *Ku kanaka. Stand tall*. Honolulu, HI: A Kolowalu Book.

³⁵⁰ Beamer, K., Souza, P., Elkington, K. (2025). *Wai and the Ancestral Circular Economy*. In K. Beamer (Ed.), *Waiwai: Water and the future of Hawai‘i*(pp. 19-43). University of Hawai‘i Press.

³⁵¹ *Ibid.*

- **Wellbeing:** Measuring success beyond gross domestic product (GDP), to include indicators of environmental health, social wellbeing, cultural vitality, and the overall thriving of Hawai‘i’s people and communities.
- **Circularity:** Designing out waste and pollution, keeping products and materials in use through reuse, repair, and recycling, and regenerating natural systems. This involves tracking and optimizing material and energy flows through the economy as well as being aware of boundaries and limits of resource and energy use which can cause irreparable harm to our ecology and the systems and cycles that hold it in balance.
- **Solidarity Economy:** Prioritizing community-based, cooperative, and reciprocal economic models that foster mutual aid, equitable distribution, and collective ownership and stewardship.

Hawai‘i’s unique geographic isolation and fragile ecosystems make the transition to a circular economy not just an ecological imperative but a socioeconomic necessity. Building on a foundation of principles, this policy encompasses a transformative strategy across diverse sectors.

12.2 Measure Description

Whereas several measures under the umbrella of a Circular Economy are found across diverse sectors and have already been outlined in the previous chapters, the measures addressed here will further accelerate Hawai‘i’s adoption of a circular and wellbeing economy.

Economic Incentives to Accelerate Circular Innovation

Incentivizing closed-loop material use - Tax reforms, such as tax rebates, should be implemented favoring circular practices such as products and materials that can be repaired, reused or composted, use of and reuse or products for a long period of time and sharing of resources and materials. These measures would go alongside levies on non-recycled materials, such as plastics, metals and textiles to incentivize closed-loop material use.

Establish statewide Buy Clean policies – Whereas procurement laws already make references to environmental issues and make preferences to local vendors, Buy Green policies to purchase low carbon and green products and services would further incentivize local business providers to change their practices to a more circular economy.

Incorporate Green Budgeting in the State budget – The FY23/24, state budget was approximately \$17.2³⁵² billion. The state can demonstrate what the money was spent on but not if that funding was in line with State priorities. Green budgeting looks at every budget item through a climate lens, identifying how each expenditure, tax policy, or investment will move the government closer to or further from climate goals. Green budgeting allows governments to identify which budget items are *green-positive* (supporting climate/environmental goals), *neutral*, or *harmful*. By

³⁵² 04 - Summary of Expenditure Variances FY 24 and FY 25 Variance Report [04 - Summary of Expenditure Variances FY 24 and FY 25 Variance Report](#)

monitoring how green spending performs against set indicators such as greenhouse gas reduction targets, renewable capacity or tree cover, governments are able to be more transparent and demonstrate how money supports or hinders sustainability. Green budgeting connects climate goals across sectors, finance, energy, transport, agriculture, ensuring consistent policy rather than isolated projects. Green budgeting can also help generate more funding for climate projects through green bonds or international climate finance, since governments can show robust climate-aligned fiscal frameworks. The proposal here is to implementing Green Budget to the “Green Fee” by 2027³⁵³

Improve incorporation options for cooperatives – Cooperatives play a significant role in advancing both circular and wellbeing economies by fundamentally reimagining how economic systems serve people and the planet rather than pursuing endless growth. By their democratic structure and member-centered governance, cooperatives embed sustainability and social wellbeing into their core operations, ensuring that business decisions reflect the collective interests of members and communities rather than external shareholders seeking short-term profits. In a circular economy context, cooperatives naturally align with principles of resource efficiency and waste reduction, as they are structured to reinvest surpluses into their members, employees, training, and community projects rather than extracting wealth from local areas. This model actively regenerates local resources and territories by retaining capital within communities, creating what researchers call a “virtuous cycle of economic growth” where business success directly benefits the people who live and work in the region. Beyond environmental resilience, cooperatives advance wellbeing by democratizing economic participation—giving each member a voice and vote regardless of capital investment, which fosters a sense of ownership and autonomy that counters the powerlessness prevalent in conventional capitalist structures. Agricultural, worker, and consumer cooperatives exemplify this integration by simultaneously advancing decent work, gender equality, food security, and environmental stewardship through practices like sustainable farming, fair pricing, and equitable profit-sharing. Ultimately, cooperatives demonstrate that economies can be structured around multiple bottom lines - social, economic, and environmental - prioritizing shared prosperity and long-term community resilience over individualized gain, thereby offering a practical alternative pathway toward the regenerative, inclusive systems that circular and wellbeing economies envision.

Hawai‘i currently has limited options for the incorporation of cooperatives as either an agricultural producer cooperative or consumer cooperative. Other forms of incorporation such as multi-stakeholder cooperatives and worker-owned cooperatives would increase the number of options and arguably grow the cooperative movement in the State. As research shows cooperatives help to keep wealth local, increase community ownership and have values associated with long-term

³⁵³ The Green Fee, officially enacted as Act 96 increases the state's transient accommodations tax (TAT) by 0.75% (raising the overall TAT to 11% starting January 1, 2026, and projected to rise to 12% in 2027), and for the first time, includes cruise ship accommodations. It is estimated to generate \$100 million a year.

wellbeing of the community as part of their core mission, and as such are closely aligned with values around sustainability and climate resilience.³⁵⁴

Establish a Circular Economy consortium – A Circular Economy Consortium supported by the State and in partnership with counties, the non-profit and business sector would support transition and encourage innovation towards a circular economy. The consortium would provide opportunities for investing further in this sector and a platform for exchanging knowledge and practices to accelerate the transition to a circular economy.

Community Empowerment and Resilience Building

Utilize community-based organizations for state and county outreach and consultation. Strengthening and resourcing locally based community organizations should be a central strategy for improving climate governance in Hawai'i. State and County agencies increasingly recognize that existing outreach and planning processes have not adequately empowered community members to meaningfully shape and design climate actions for their communities, particularly in rural or historically underrepresented areas. Partnering with established, trusted community-based organizations as implementation partners for outreach, consultation, and stewardship would help agencies reach far beyond the individuals who already participate in neighborhood boards, town halls, or professional climate spaces.

Community feedback strongly echoed this need, emphasizing the importance of engagement that actively seeks representative participation and creates accessible spaces where all community voices can be included. Hiring and resourcing these organizations to lead culturally grounded outreach and consultation would better connect residents to stewardship and decision-making roles, elevate place-based practices, and ensure that historically underserved and rural communities can directly influence climate adaptation and natural resource management across the state.

Establish resilience grant program in collaboration with state and counties offices to support programs that build community resilience to climate hazards, threats, risks and impacts.

Examples could include:

- Tool libraries
- Repair circles and material swaps
- Programs to make it easier for people to find, share and access resources.
- Microgrids
- Food banks
- Emergency management
- Job and skill training which relate to the circular economy, such as repair technicians, mechanics to work on electric cars.

³⁵⁴ Allimadi, A., Ge, H., & Yang, W. (2021). Accelerate action to revamp production and consumption patterns: the circular economy, cooperatives and the social and solidarity economy. Available at: <https://social.desa.un.org/publications/accelerate-action-to-revamp-production-and-consumption-patterns-the-circular-economy>.

Streamline accessibility to supportive resources and information. In this age where information can be accessed on many different platforms it is challenging to get resources to those that need it most. With social media, music streaming and national news so readily available traditional methods of conducting outreach, local paper, radio, and news is not as effective as it once was. Organizations are needing to be more and more creative in ways to get the information out. Building community through supporting and utilizing existing community organization and networks is key as is streamlining accessibility to the many resources available. By creating a one-stop-shop for affordability and resiliency financial and technical support modeled after websites such as <https://www1.seattle.gov/assistance-and-discounts> could help to streamline community engagement in climate resiliency and affordability programs. The easy search parameters, income and zip-code allow people to explore what resources are available to them versus having to know beforehand. Providing information on climate resources with everyday needs and programs that people rely on such as SNAP and Medicaid could further help reduce the burden of connecting affordability and resilience programs to those who need it most.

Monitoring Framework

Consumption-based inventory of GHG – The GHG emissions upon which this CAP is based came from an inventory produced by the State’s Department of Health. This current production-based inventory accounts for all GHG emissions released within Hawai‘i’s borders. This method, however, overlooks a significant part of our footprint: emissions generated elsewhere to produce the goods and services we import and consume. Adopting a consumption-based inventory provides a more holistic picture by tracking the full lifecycle emissions of everything Hawai‘i residents consume, regardless of where it was made. For an island state reliant on imported food, materials, and products, this complementary approach is essential for revealing the true scale of our global impact and identifying new strategies to reduce it through sustainable consumption, procurement, and materials management.

Development of Circular Economy Index and ‘Āina Resilience Matrix - Develop a new, integrated monitoring tool designed to accelerate Hawai‘i’s transition to a resilient and circular economy. The core innovation is a dual-index framework consisting of the Hawai‘i Circular Economy Index (CEI) and the ‘Āina Resilience Matrix (ARM). The CEI serves as a performance dashboard measuring the actions and economic shifts taken, tracking indicators like a Circular Material Use Rate, Landfill Diversion, and Circular Economy Jobs. Its purpose is to quantify the systemic change from a linear "take-make-waste" model to a circular "regenerate-circulate-eliminate" model. The ARM is the ecological counterpart, measuring the outcomes and ecological consequences of actions developed in this CAP for targets such as forest and watershed protection, regenerative agriculture and combating invasive species. It should be built on scientifically robust, locally calibrated metrics for soil health and habitat and species recovery. A key aspect is also finding ways of integration of the two indices. For instance, organic waste diversion (CEI) to soil health regeneration (ARM). This integration is designed to create a verifiable Measurement, Reporting, and Verification (MRV) system to unlock new partnerships and large-scale funding opportunities. The entire framework is strategically aligned with the state's 2045 carbon neutrality goals and will be implemented through collaboration with existing platforms such as the Aloha+ Challenge Dashboard, ensuring a data-driven path toward a resilient and regenerative future.

12.3 Funding source

The current administration has significantly reduced federal support for circular and well-being economy initiatives by canceling billions in climate and community-focused grants. While selected recycling infrastructure programs from the EPA continue for now, the funding landscape is increasingly polarized, with a growing reliance on private-sector investment and local efforts to drive forward the circular economy. This demonstrates a clear federal withdrawal from many of these programs, contrasting with increased momentum in other funding areas.

Federal Funds

Leveraging USDA and EPA programs targeting island sustainability. Solid Waste Infrastructure for Recycling (SWIFR) Grants: EPA these grants are specifically targeted at building the circular economy infrastructure (e.g., composting facilities, reuse centers). Hawai‘i County has already secured \$1.5 million from this program to implement a reusable foodware system, demonstrating the viability of this funding stream for scaling Circular Economy Initiatives statewide.

Other Federal Agencies (ie Department of Energy) have also issued calls for proposals which support the Circular Economy.

The North American Partnership for Environmental Community Action (NAPECA) grant program is funded by the Commission for Environmental Cooperation, with Canada, Mexico, and the United States equally contributing through their environmental agencies. The NAPECA grant program supports circular economy and community based environmental projects including waste reduction, materials reuse, and sustainable consumption initiatives that can help Hawai‘i reduce waste and lower emissions. Its current funding round calls for projects focused on circular economy strategies, zero waste transitions, or resource recovery systems.³⁵⁵

State Funds

The “Green Fee”, enacted through Act 96, in 2025, which directly links tourism revenue to climate resilience and environmental stewardship, projecting approximately \$100 million annually for initiatives which could take place within the remit of a Circular and Wellbeing Economy.

Producer Fees: Generate \$85 million annually from EPR program participants. A “Phase 2” implementation of waste policy, anchored by the comprehensive needs assessment carried out by DOH promises a radical restructuring of environmental finance. By shifting the liability for end-of-life management to producers, Hawai‘i has the potential to mobilize more than \$100 million annually by the end of the decade.

The 2025 *Compost Reimbursement* Hawai‘i program covers up to 50% of the cost for farmers to purchase and transport compost has \$400,000 for the 2025-2026 year.

³⁵⁵ North American Partnership for Environmental Community Action Grant Programs, accessed December 5, 2025, <https://www.cec.org/grant-programs/>

The HŌ‘IHI Grant Program, administered by the Office of Native Hawaiian Relations, provides grants of \$50,000 to \$200,000 to eligible Native Hawaiian organizations for work that advance a wellbeing economy, including sustainable land and sea stewardship, ecosystem restoration, and community-centered resource management. In recent rounds, the program has awarded \$1 million total across multiple grantees, supporting regenerative tourism, ‘āina based stewardship, and cultural ecological resilience initiatives in Hawai‘i.³⁵⁶

County Funds

County Recycling Grants: Programs like Kaua‘i County's Recycling and Waste Diversion Grant (\$40,000 available for FY 2026) for instance, provide seed funding for community-level circular economy pilots.

The County of Hawai‘i Research & Development Impact Grants program supports circular-economy and community-wellbeing initiatives, such as composting, materials reuse, and sustainable food systems. For FY 2024–2025 it awarded a total of \$548,095 across 31 projects, and for FY 2025–2026 it allocated \$386,300 for 19 projects.³⁵⁷

Public-Private & Philanthropic Partnerships

The Bank of Hawai‘i Foundation: Bank of Hawai‘i Foundation Community Development Grants provide community-development grants that can support circular-economy and wellbeing-economy initiatives in Hawai‘i, such as food security, social services, and community resilience. In 2023 the foundation awarded more than \$1.6 million across about 60 local nonprofits, with the average grant size around \$7,000, making it a modest but steady funding source for grassroots community and sustainability projects.³⁵⁸

Lisle International: The Global Seed Grants support small, innovative, community-based projects that foster intercultural understanding, collaboration, and shared learning among people from diverse cultural, ethnic, religious, or social backgrounds. Past funded projects have included youth cultural workshops, arts-based community events, and environmental or community-development projects that bring together people from different backgrounds to collaborate.³⁵⁹

Ulupono Initiative: As a key impact investor in Hawai‘i, Ulupono actively funds projects in local food production, renewable energy, and waste reduction. Their support can be leveraged to provide the “matching funds” often required for federal grants.

³⁵⁶ Office of Native Hawaiian Relations HŌ‘IHI Grant Program for Native Hawaiian Organizations, accessed December 5, 2025, [https://www.doi.gov/Hawai‘ian/hoihi-2025-grant-application-information#:~:text=Fiscal%20Year%202025%20Priorities,at%20areas%20impacted%20by%20tourism;](https://www.doi.gov/Hawai%27ian/hoihi-2025-grant-application-information#:~:text=Fiscal%20Year%202025%20Priorities,at%20areas%20impacted%20by%20tourism;)

³⁵⁷ County of Hawai‘i Research & Development Impact Grants, accessed December 5, 2025, [https://www.rd.Hawai‘icounty.gov/funding-grant-resources/impact-grants](https://www.rd.Hawai%27icounty.gov/funding-grant-resources/impact-grants)

³⁵⁸ Bank of Hawai‘i Foundation Community Development Grants, accessed December 5, 2025, [https://www.boh.com/philanthropy/grants/bank-of-Hawai‘i-foundation](https://www.boh.com/philanthropy/grants/bank-of-Hawai%27i-foundation)

³⁵⁹ Lisle International Global Seed Grants, accessed December 5, 2025, <https://lisleinternational.org/global-seed-grants/apply/>



13. Tourism

MEASURES

- 1) DEVELOP A TOURISM-SPECIFIC GHG INVENTORY
- 2) ENSURE CONSISTENT IMPLEMENTATION AND RIGOROUS ENFORCEMENT OF STATE AND COUNTY POLICIES LAND USE REFORM, BUILDING PERFORMANCE STANDARDS, AND WASTE MANAGEMENT.
- 3) INVESTMENT IN REGENERATIVE PRACTICES THAT ACTIVELY RESTORE NATURAL ECOSYSTEMS, SUPPORT CULTURAL PRESERVATION, AND ENHANCE COMMUNITY WELL-BEING.
- 4) INTENSIFY EFFORTS TO EDUCATE VISITORS ON RESPONSIBLE TRAVEL PRACTICES SUCH AS “TRAVEL PONO” AND THE UNIQUE ECOLOGICAL AND CULTURAL SENSITIVITIES OF THE ISLANDS.
- 5) CONTINUE TO SUPPORT THE DIVERSIFICATION OF HAWAII’S ECONOMY TO REDUCE OVER-RELIANCE ON TOURISM, WHILE SIMULTANEOUSLY BUILDING RESILIENCE WITHIN THE TOURISM SECTOR ITSELF TO WITHSTAND FUTURE CLIMATE-RELATED DISRUPTIONS AND ECONOMIC SHOCKS.

13. Tourism

13.1 Overview of the Tourism Sector

The State of Hawai‘i’s tourism sector, a cornerstone of its economy, faces the dual imperative of economic recovery following COVID’s impact on the sector and robust climate action. This chapter details the significant climate and environmental footprint of Hawai‘i’s tourism, from substantial greenhouse gas (GHG) emissions primarily associated with air travel to the strain on vital natural resources and socio-cultural well-being. A pivotal innovation, the “Green Fee”, enacted through Act 96, in 2025, directly links tourism revenue to climate resilience and environmental stewardship, projecting approximately \$100 million annually for these critical initiatives. This policy, alongside the strategic shift towards a “regenerative tourism” model, signifies a profound re-evaluation of tourism’s purpose, prioritizing the sustainability of natural, cultural, and community resources.

Economic Significance and Contribution to the State Economy

In 2022, the tourism sector generated \$19.29 billion in total visitor spending, an 8.9% increase from 2019, and contributed \$2.24 billion in state tax revenue, an 8.2% increase from 2019. These economic gains were made despite an 11% decrease in 2022 from the visitors recorded in 2019 indicating a reduction in visitors can also mean sustained economic inputs.³⁶⁰ Prior to the pandemic, in 2019, tourism supported a substantial 216,000 jobs statewide. Projections by DBEDT indicate a steady growth in visitor numbers, reaching 9.678 million visitors in 2025, and spending, reaching just over \$22 billion in 2028.³⁶¹

The devastating 2023 Maui wildfires further underscored that the state is susceptible to external shocks, including pandemics, natural disasters, and global economic shifts. Consequently, strategies within the CAP must not only focus on mitigating environmental impacts but also on enhancing economic resilience through diversification and a strategic shift towards a more stable, less volume-dependent tourism model that can better withstand future disruptions, including those exacerbated by climate change.

The implementation of the “Green Fee” (Act 96, 2025) explicitly recognizes the intrinsic connection between ecological health and economic prosperity.³⁶² This measure, particularly in the aftermath of the Maui wildfires, signals a re-evaluation of tourism’s purpose beyond mere economic output to include direct contributions to environmental and community well-being. This policy direction, alongside the projected decline in international air seats, suggests a potential strategic pivot towards attracting a higher-value, more environmentally conscious visitor segment, rather than solely pursuing volume-based growth. This indicates a maturing understanding of the

³⁶⁰ Fact Sheet: Benefits of Hawai‘i’s Tourism Economy, accessed July 17, 2025, <https://www.hawaiitourismauthority.org/media/11276/tourism-econ-impact-fact-sheet-june-2023.pdf>

³⁶¹ DBEDT Economists Lower Hawai‘i Economic Growth Projections, accessed July 17, 2025, <https://dbedt.hawaii.gov/blog/25-20/>

³⁶² Ibid.

interconnectedness of economic prosperity and environmental health, as the state moves towards internalizing the environmental costs of tourism and setting a precedent for other tourism-dependent economies.

Visitor Trends and Industry Landscape

The Hawai‘i Tourism Authority (HTA) functions as the state’s primary agency for managing tourism, operating under a framework guided by four foundational pillars: natural resources, Hawaiian culture, community, and brand marketing. The HTA’s overarching mission is to strategically manage tourism in a sustainable manner, ensuring alignment with economic objectives, cultural values, the preservation of natural resources, community aspirations, and the needs of the visitor industry.³⁶³

HTA’s 2020-2025 Strategic Plan places a strong emphasis on the development of sustainable and regenerative tourism practices. This strategic direction is explicitly aligned with global sustainability frameworks, specifically supporting the United Nations' 17 Sustainable Development Goals (SDGs) and the UN 2030 Agenda for Sustainable Development.³⁶⁴ This explicit support for global sustainability frameworks demonstrates Hawai‘i is actively positioning itself as a leader in sustainable tourism, which could attract environmentally conscious travelers and stimulate investments in green technologies and practices.

A significant evolution within the industry is the deliberate shift towards a “regenerative tourism” model. This approach is designed to prioritize the sustainability of natural, cultural, and community resources, moving beyond sustainability to actively restore and enhance the destination. Regenerative tourism recognizes the interconnectedness of environmental, social, and economic factors, with the aim of fostering thriving communities and providing meaningful visitor experiences while simultaneously improving the well-being of the environment, residents, and indigenous communities for future generations.³⁶⁵ This redefinition of success moves beyond traditional metrics like visitor arrivals and expenditures to include resident sentiment, cultural preservation, and environmental health as core performance indicators. This is crucial for gaining community support for the industry and ensuring its long-term viability in the face of climate change, as it implies that future growth will be measured not just by economic output but by its positive contribution to the islands' ecological and social well-being.

As part of its 2020-2025 Strategic Plan, HTA in partnership with the counties and island visitor bureaus, launched the Destination Management Action Plans (DMAPs) for Kaua‘i, Maui Nui (Maui, Moloka‘i, and Lāna‘i), O‘ahu, and Hawai‘i Island, which aimed to realign tourism with community values and address long-standing concerns about its impact on residents, resources, and infrastructure. The plans emphasized destination management by promoting responsible

³⁶³ Who We Are - Hawai‘i Tourism Authority, accessed July 17, 2025, <https://www.hawaiitourismauthority.org/who-we-are/>

³⁶⁴ 2024 HTA Annual Report to the Legislature - Hawai‘i Tourism Authority, accessed July 17, 2025, https://www.hawaiitourismauthority.org/media/13946/2024-hta-annual-report-to-the-legislature_rev_ada.pdf

³⁶⁵ Ibid.

visitor behavior, alleviating overcrowding at popular sites, and strengthening partnerships to protect Hawai‘i’s natural and cultural assets.³⁶⁶

13.2 Climate and Environmental Impacts of Tourism

General Environmental Pressures and Resource Strain

The visitor industry in Hawai‘i exerts substantial impacts across various facets of the islands, including its physical infrastructure, natural resources, and the socio-cultural fabric of its communities.³⁶⁷ Historically, a significant shift from an agrarian economy to one dominated by tourism has driven extensive land development throughout the islands. Hawai‘i, despite comprising only 0.2% of the nation’s land area, disproportionately accounts for 75% of its extinctions and more 30% of its rare or endangered species. Tourism-related development has contributed significantly to this ecological vulnerability. The continuous urban expansion required to accommodate the growing number of visitors has imposed a considerable toll on the islands’ fragile environment.³⁶⁸

In the post-pandemic period, residents have increasingly vocalized concerns regarding “overtourism”. These concerns extend beyond mere crowding to encompass issues such as congested parking lots, severe trail erosion, and a palpable strain on local natural and grey infrastructure.³⁶⁹ This indicates a fundamental misalignment between the current tourism model and community well-being. Addressing “overtourism” therefore requires a shift from simply managing visitor numbers to managing the *impact* of tourism, prioritizing quality over quantity, and ensuring a more equitable distribution of benefits and burdens. This necessitates robust destination management plans with clear, measurable benchmarks and accountability, moving beyond superficial initiatives. It also highlights that resident sentiment is a critical indicator of sustainability and must be central to any climate action plan.

Specific Impacts on Natural Ecosystems (e.g., Coral Reefs, Biodiversity, Land Use)

Hawai‘i is home to over 400,000 acres of coral reefs, which are highly sensitive and vital ecosystems. These reefs are particularly vulnerable to changes in ocean temperature and acidity.³⁷⁰ Rising sea surface temperatures and marine heatwaves are increasing the frequency and severity of coral bleaching events, a phenomenon where stressed corals expel the algae that provide their food, leading to whitening and increased susceptibility to disease. A notable example occurred in

³⁶⁶ Hawai‘i Tourism Authority, ‘Destination Management’, available from <https://www.hawaiitourismauthority.org/what-we-do/destination-management/>

³⁶⁷ Visitor Statistics | Overview - Department of Business, Economic Development & Tourism, accessed July 17, 2025, <https://dbedt.hawaii.gov/visitor/sustainable-tourism-project/overview/>

³⁶⁸ DLNR Hawai‘i Statewide Assessment of Forest Conditions and Resource Strategy (2010), <https://dlnr.hawaii.gov/forestry/files/2013/09/SWARS-Issue-6.pdf>

³⁶⁹ Big Plan To Fix Hawai‘i Tourism Just Got A Brutal Reality Check, accessed July 17, 2025, <https://beatofhawaii.com/big-plan-to-fix-hawaii-tourism-just-got-a-brutal-reality-check/>

³⁷⁰ Climate Change Connections: Hawai‘i (Coral Reefs) | US EPA, accessed July 17, 2025, <https://www.epa.gov/climateimpacts/climate-change-connections-hawaii-coral-reefs>

2014, when 80% of the dominant corals in Kaneohe Bay, O‘ahu, experienced bleaching.³⁷¹ Beyond climate change, direct human impacts from tourism, such as sunscreen chemicals and heavy foot traffic, also contribute to reef degradation.

Research provides compelling evidence that human presence significantly alters the community structure of marine ecosystems. A study conducted in the Molokini Marine Life Conservation District (MLCD) observed that key reef predators, such as ‘ōmilu, were displaced from shallow, preferred waters into deeper, less optimal habitats when tourism activities resumed post-pandemic. This directly demonstrates the impact of high-density marine tourism on sensitive ecological balances.³⁷² Similarly, coral bleaching is a direct, visible consequence of climate change exacerbated by human activity. These are clear feedback loops where tourism's activities directly degrade the very natural assets that attract visitors. This highlights the urgent need for targeted destination management, strict environmental regulations, and effective visitor education programs, such as “Travel Pono”, to mitigate these direct, observable impacts. It reinforces that protecting natural resources is not just an environmental goal but an economic necessity for the long-term viability of Hawai‘i's tourism industry.³⁷³

Land development for tourism has led to severe impacts on Hawai‘i's fragile coastal and conservation areas. For instance, a large hotel project on the Hawai‘i Island destroyed 70% of unique anchialine ponds during its construction, illustrating the direct ecological damage caused by unchecked development.³⁷⁴ A systemic challenge to effective climate adaptation and sustainable land use in Hawai‘i is the continued reliance on outdated land classification studies, some dating back to the 1930s. These legacy classifications, which predate Hawai‘i's statehood, continue to influence critical land use decisions across the islands, including on agricultural lands. A 2024 state report warned that these classifications “obscure the true potential of Hawai‘i's lands” and complicate efforts to adapt to modern agricultural and land development needs, representing a “dramatic departure from the holistic resource management principles of the ahupua‘a system”.³⁷⁵

Overcoming these entrenched planning legacies is crucial requires comprehensive, culturally informed land-use reform that integrates contemporary climate science and ecological carrying capacities. Without addressing these underlying systemic issues, even well-intentioned climate actions may be hampered by an outdated regulatory environment.

³⁷¹ Ibid.

³⁷² Division of Aquatic Resources | 4/24/23 – Measuring the impacts of tourism on marine ecosystems - Hawaii.gov, accessed July 17, 2025, <https://dlnr.hawaii.gov/dar/measuring-the-impacts-of-tourism-on-marine-ecosystems/>

³⁷³ Sustainable Tourism Association of Hawai‘i | Hawai‘i STAH Tours & Education, accessed July 17, 2025, <https://www.sustainabletourismhawaii.org/>

³⁷⁴ Matsuoka, J., & Kelly, T. (1988). The environmental, economic, and social impacts of resort development and tourism on native Hawaiians. *J. Soc. & Soc. Welfare*, 15, 29. https://scholarworks.wmich.edu/context/jssw/article/1868/viewcontent/JSSW_15.4_2_MATSUOKA.pdf

³⁷⁵ “Soil Classification Systems & Use In Regulating Agricultural Lands Study” DBEDT 2024, https://data.capitol.hawaii.gov/sessions/session2025/bills/DC174_.pdf

Socio-Cultural Dimensions and Community Well-being

The expansion of the tourism industry in Hawai‘i has contributed to a degradation of cultural values, compromised cultural integrity, diminished the presence of Native Hawaiians in visitor centers, and devalued sacred places, known as “wahi-pana”.³⁷⁶ Many Native Hawaiians express a profound sense of alienation from their ancestral lands due to the imposition of western economic systems, including tourism, which has historically proceeded without their explicit consent.³⁷⁷

Incorporating social equity, cultural preservation, and community well-being metrics is needed. The State needs to actively restore and enhance, rather than just mitigate impacts to natural, cultural and community resources to reflect a deeper commitment to the islands’ overall well-being. The success of addressing cultural fracturing will depend heavily on the effective and widespread implementation of regenerative tourism principles. This involves fostering genuine collaboration, empowering local communities, and investing in initiatives that not only reduce environmental footprint but also actively contribute to cultural revitalization and community resilience. This approach transforms tourism from a potential burden into a force for positive change.

13.3 Numbers and Targets: GHG Emissions, Energy Use, and Waste Management

Greenhouse Gas Emissions from the Tourism Sector

Air Travel Emissions

The “average” visitor's round-trip flight to Hawai‘i in 2019 contributed approximately 1.8 tons CO₂e. It is important to note a significant discrepancy: Hawai‘i's official 2019 Greenhouse Gas Inventory reported “Domestic Air Transport” emissions as 3.2 million tons CO₂e. This category typically includes inter-island flights and flights departing from Hawai‘i to the U.S. continent but *excludes* continental arrivals and international flights (both arrivals and departures). Furthermore, this official inventory often does not account for “non-CO₂ emissions” such as water vapor, ice crystals (contrails), and nitrogen oxides from flights above 9,000 meters, which can have up to twice the global warming potential of CO₂ alone and comprise 90% of the flight time to and from Hawai‘i.³⁷⁸

The stark contrast between the estimated 18 million tons (accounting for the total number of visitors) CO₂e from visitor air travel and the 3.2 million tons reported in Hawai‘i's official GHG inventory for “Domestic Air Transport” highlights a critical data and accountability gap. The official figure significantly underrepresents the true carbon footprint of tourism by excluding continental arrivals, international flights, and non-CO₂ radiative forcing effects. This situation

³⁷⁶ Socio-Cultural Impacts of Tourism in Hawai‘i – Impacts on Native Hawaiians - Hawaii.gov, accessed July 17, 2025, <https://files.hawaii.gov/dbedt/visitor/sustainable-tourism-project/drafts/Native-Hawaiian-Impact-Report.pdf>

³⁷⁷ 2024 HTA Annual Report to the Legislature - Hawai‘i Tourism Authority, accessed July 17, 2025, https://www.hawaiitourismauthority.org/media/13946/2024-hta-annual-report-to-the-legislature_rev_ada.pdf

³⁷⁸ Ibid.

demands that Hawai‘i’s CAP explicitly acknowledge and address these “imported” emissions, even if direct control over international aviation is limited. It strengthens the ethical and financial justification for policies like the “Green Fee” to fund mitigation and adaptation efforts, framing tourism as a global climate responsibility. This also suggests a need for a shift in tourism strategy to prioritize visitors who are willing to offset their travel impact or choose lower-carbon travel options, moving towards a more conscious and equitable tourism model.

On-Island Operational Emissions (Accommodation, Transportation, etc.)

Beyond air travel, tourism operations on the islands also contribute to GHG emissions. A study focusing on Hawai‘i Island estimated that tourism sectors, including accommodations, food and beverages, golf courses, tourism services, and rental cars, collectively account for 21.7% of the island’s total energy consumption.³⁷⁹ This study indicated that visitors generated over 22% of the state’s total emissions through their expenditure patterns.

Tourism’s specific contribution to on-island emissions is not aggregated into a comprehensive, statewide tourism-specific GHG inventory with explicit sector-specific reduction targets. County-level plans address general emissions from transportation, electricity, and waste but do not disaggregate these for the tourism sector. This indicates a significant data and reporting gap for effectively managing tourism’s on-island carbon footprint. To ensure accountability and targeted policy implementation within the sector, the development of a more granular, tourism-specific GHG inventory and establish clear, measurable reduction targets for the industry’s on-island operations is needed.

Waste Generation and Reduction Initiatives

The tourism sector contributes measurably to waste generation in Hawai‘i. On Hawai‘i Island, it is estimated that tourism sectors collectively account for 10.7% of the island’s total waste generation.³⁸⁰ More specifically, accommodation facilities on Hawai‘i Island produced 5.9 kg of Municipal Solid Waste (MSW) per guest, while restaurants generated 2 kg per guest.³⁸¹ When considering waste generation per employee, the accommodation sector produced 2.4 kg of MSW daily, and the Food & Beverage (F&B) sector generated 9.8 kg daily, assuming F&B waste is primarily from tourists in the accommodation sector. An analysis of the total tourism-related waste on Hawai‘i Island revealed that 62% originated from restaurants, 27% from accommodation, and 7% from golf courses.³⁸²

The observation that “waste from tourism systematically remains hidden behind residential waste flows” indicates a significant challenge in accurately attributing and managing waste generated by the sector.³⁸³ This lack of precise information can lead to municipal fees being set without proper consideration of producers’ contributions, potentially causing budget imbalances and cross-

³⁷⁹ Saito, O. (2013). Resource use and waste generation by the tourism industry on the big island of Hawaii. *Journal of Industrial Ecology*, 17(4), 578-589.

https://kohalacenter.org/archive/pdf/Research_BI_ResourceUseWasteGenerationTourism.pdf

³⁸⁰ Saito, O. (2013). Resource use and waste generation by the tourism industry on the big island of Hawaii.

³⁸¹ Saito, O. (2013). Resource use and waste generation by the tourism industry on the big island of Hawaii.

³⁸² Saito, O. (2013). Resource use and waste generation by the tourism industry on the big island of Hawaii.

³⁸³ Saito, O. (2013). Resource use and waste generation by the tourism industry on the big island of Hawaii.

subsidies between residential and economic activities. This situation highlights a critical need for enhanced data collection and reporting on tourism-specific waste streams to ensure equitable waste management policies and to reinforce the principle of extended producer responsibility.

Resource/Waste Category	Percentage of Island's Total
Energy Consumption	21.7%
Water Consumption	44.7%
Waste Generation	10.7%

Table 75: Table Estimated Tourism Sector Resource Consumption and Waste Generation (Hawai‘i Island)

13.4 Policy and Governance Innovations

A landmark policy innovation is the climate impact fee better known as the “Green Fee” (Act 96, 2025). This legislation increases the state's transient accommodations tax (TAT) by 0.75% and for the first time, includes cruise ship accommodations.³⁸⁴ This levy is projected to raise approximately \$100 million annually, with a dedicated portion of the revenue directed towards climate resilience, environmental stewardship, and sustainable tourism programs. The “Green Fee” serves as a model for climate finance, directly internalizing the environmental externalities of tourism and creating a dedicated funding stream for mitigation and adaptation efforts. It sets a precedent for other tourism-dependent economies by explicitly linking visitor contributions to the protection of the very natural resources that attract them.

On Kaua‘i, the Hanalei Initiative’s North Shore Shuttle, the first of its kind in Hawai‘i, has become a model for responsible tourism management by balancing visitor access with community well-being and environmental conservation. In 2023 alone, the shuttle transported more than 160,000 passengers, eliminating over 63,000 cars—or nearly 200 vehicles per day—from the narrow Waipā to Hā‘ena corridor, resulting in a 20% reduction in traffic and measurable improvements to local air quality and safety. Daily ridership has grown from an average of 325 to over 440, underscoring its essential role in the community’s transportation network. Beyond reducing congestion, the shuttle provides free rides for residents, employs over 30 North Shore locals, reinvests in the community through partnerships and grants to nonprofits, and enhances the visitor experience with cultural education and improved signage. Additionally, the community can temporarily suspend the shuttle reservation system during heavy rainfall and potential flash floods. Together, these impacts demonstrate how the shuttle not only mitigates the challenges of high tourist volumes but also strengthens the resilience, connectivity, and cultural identity of Kaua‘i’s North Shore.

³⁸⁴ “Historic Green Fee Launched To Combat Climate Change In Hawai‘i”, <https://governor.hawaii.gov/main/historic-green-fee-launched-to-combat-climate-change-in-hawai'i/>

Industry-Led Initiatives and Technologies

Globally, hotel chains are increasingly focusing their waste reduction efforts on single-use plastics and food waste, recognizing these as primary waste streams within the industry.³⁸⁵ Specific waste reduction strategies implemented within the hotel industry include: purchasing in bulk, requesting suppliers to minimize packaging, reusing incoming packaging materials, utilizing washable and reusable plates, cups, and utensils, employing rechargeable batteries, repairing equipment instead of replacing it, donating obsolete items to charities, using liquid soap and shampoo dispensers in guest rooms, providing daily newspapers only upon request, and repurposing torn linens into smaller usable items.³⁸⁶

The emphasis on waste prevention, reuse, and recycling across various county plans and hotel-specific initiatives highlights a growing recognition of the need for a more circular economy within the tourism sector. The detailed strategies, such as bulk purchasing and repurposing linens, move beyond simple waste disposal to address waste at its source and throughout its lifecycle. This approach offers significant opportunities not only for environmental benefits but also for economic savings through reduced material consumption and waste management costs. By focusing on these operational and systemic changes, Hawai‘i’s tourism industry can significantly reduce its environmental footprint and contribute to the state’s broader climate goals.

The Sustainable Tourism Association of Hawai‘i (STAH) plays a crucial role in promoting responsible travel and linking the tourism sector with local conservation initiatives. STAH offers educational programs for residents, businesses, and visitors, and operates a certification program for tour operators, encouraging the adoption of a “Triple Bottom Line” approach that prioritizes community involvement, environmental protection, and employee management. The “Travel Pono” program, meaning “to do what is right”, encourages visitors to explore Hawai‘i respectfully of Native Hawaiian culture, wildlife, and the environment.³⁸⁷ This focus on industry collaboration and certification, exemplified by STAH’s efforts, helps to standardize and elevate best practices across the sector, driving collective responsibility and improving visitor behavior.

Individual hotels and resorts are also implementing comprehensive sustainability programs. Mauna Kea Resort, for example, has established the “Moku Pūlama Fund” to support initiatives such as reforestation, Hawaiian culture and landmark sustainability, and coral reef protection. The resort has introduced electric car rental amenities, installed LED lighting and occupancy sensors, uses energy-efficient appliances, and operates its golf course with recycled water for irrigation. It also prioritizes sustainable local sourcing, investing over \$1.3 million in local agricultural businesses and harvesting honey from on-property apiaries.³⁸⁸ Prince Waikiki engages in “voluntourism” programs, cultural preservation partnerships such as supporting Hawaiian

³⁸⁵ Ibid.

³⁸⁶ Waste Prevention | Department of Environmental Services - Honolulu.gov, accessed July 17, 2025, <https://www8.honolulu.gov/env/ref/waste-prevention/>

³⁸⁷ Sustainable Tourism Association of Hawai‘i | Hawai‘i STAH Tours & Education, accessed July 17, 2025, <https://www.sustainabletourismhawaii.org/>

³⁸⁸ Sustainability | Mauna Kea Resort, accessed July 17, 2025, <https://www.maunakearesort.com/culture/sustainability>

language immersion schools, and workforce development initiatives.³⁸⁹ The American Hotel & Lodging Association (AHLA) has launched “Responsible Stay”, a broad industry initiative focused on waste reduction, water conservation, responsible sourcing, and energy efficiency across properties.³⁹⁰ These technological and operational efficiencies, ranging from smart HVAC systems and LED lighting to on-site composting and water-efficient fixtures, not only reduce environmental impact but also yield significant financial benefits through utility savings.

Recommendations

To address climatic impacts in the tourism industry several key areas warrant continued focus:

1. **Comprehensive Data Integration:** Develop a more granular, tourism-specific GHG inventory that accounts for all relevant emission sources, including a more complete assessment of visitor air travel’s total climate impact. This will enable more targeted interventions and transparent reporting of the sector's progress.
2. **Policy Cohesion and Enforcement:** Ensure consistent implementation and rigorous enforcement of state and county climate policies, particularly those related to land use reform, building performance standards, and waste management. Bridging the gap between policy intent and measurable outcomes is crucial.
3. **Investment in Regenerative Practices:** Channel resources, including those generated by the “Green Fee”, into initiatives that actively restore natural ecosystems, support cultural preservation, and enhance community well-being, moving beyond mere mitigation to truly regenerative outcomes.
4. **Visitor Education and Behavior Change:** Intensify efforts to educate visitors on responsible travel practices such as “Travel Pono” and the unique ecological and cultural sensitivities of the islands. This can foster a more mindful visitor experience and reduce negative impacts.
5. **Economic Diversification and Resilience:** Continue to support the diversification of Hawai‘i’s economy to reduce over-reliance on tourism, while simultaneously building resilience within the tourism sector itself to withstand future climate-related disruptions and economic shocks.

By systematically addressing these areas, Hawai‘i can solidify its position as a global leader in sustainable and regenerative tourism, demonstrating a viable pathway for other island economies to align prosperity with profound environmental and cultural stewardship.

³⁸⁹ Regenerative Tourism - Prince Waikiki, accessed July 17, 2025, <https://www.princewaikiki.com/regenerative-tourism/>

³⁹⁰ Hotel Industry Launches Environmental Sustainability Initiative To Provide A ‘Responsible Stay’, Accessed July 17, 2025, <https://www.ahla.com/news/hotel-industry-launches-environmental-sustainability-initiative-provide-responsible-stay>



14. Military

MEASURES

LEVERAGE MILITARY RESOURCES FOR CLIMATE READINESS COLLABORATION OF CLIMATE RESILIENCE INFRASTRUCTURE

DEVELOP PARTNERSHIPS WITH MILITARY INSTALLATIONS TO ENGAGE SKILLED STAFF FOR TRAINING AND MENTORING OPPORTUNITIES.

14. Military

Introduction

Hawai‘i is home to many military personnel. With ongoing operations and over 250,000 active-duty members and their families in the state the military are significant contributors to Hawai‘i’s GHG emissions. In Hawai‘i, 10% of the population is active military, when expanded to include veterans, retirees, and their families, that jumps to 17.4% of the population.³⁹¹ Supporting state climate actions such as public electric vehicle charging stations, flood mitigation, home energy retrofits and weatherization, wildfire, urban trees, and public transportation infrastructure will also provide significant support to military personnel, their families and veterans through reducing health impacts and increasing safety and affordability.

14.1 Overview

Since the release of *The National Security Implications of a Changing Climate* in 2015 by the White House, the US military has recognized that climate change is an urgent and growing threat to our national security, contributing to increased natural disasters, refugee flows, and conflicts over resources like water and food. The report goes on to identify threats to critical infrastructure, through climate-related impacts such as sea level rise, increased storm surges and erosion, extreme temperatures that stress energy infrastructure, and an increase in wildfires, among other stressors.³⁹²

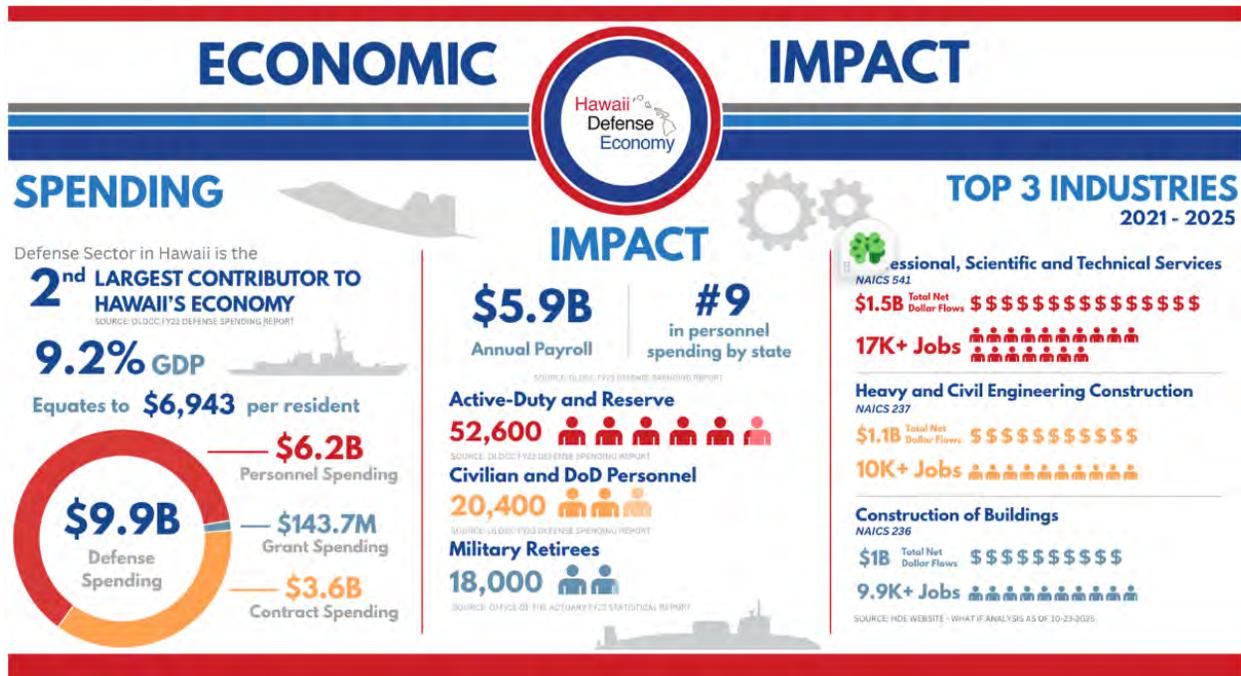
The military is estimated to contribute \$10 billion in Defense spending to the state in FY23, making defense spending the second-largest contributor to the state’s Gross Domestic Product (GDP), second only to tourism.³⁹³ The defense sector provides billions of dollars in payroll and contracts for local businesses, millions in grant funding, brings in billions of dollars in federal funding annually, supporting industries such as construction, engineering services, shipbuilding, and repair (figure)³⁹⁴. However, many of the military personnel are not residents of the state and pay taxes elsewhere. As there is no public information on this, it is difficult to assess the amount of funding that makes its way to the state of Hawai‘i through military spending.

³⁹¹ Hawaii Defense Economy-A Community and Business Resource, accessed November 10, 2025
<https://defenseeconomy.hawaii.gov/defense-economy-personnel/>

³⁹² Findings from Select Federal Reports: *The National Security Implications of A Changing Climate*, 2015. [National Security Implications of Changing Climate Final 051915.pdf](#)

³⁹³ About the Readiness and Environmental Protection Integration (REPI) Program, accessed July 20, 2025.
www.repi.mil

³⁹⁴ Hawaii Defense Economy- A Community and Business Resource, accessed July 20, 2025.
<https://defenseeconomy.hawaii.gov/>



Hawaii Defense Economy ³⁹⁵

14.2 Impact of Sector

Community tension

Military and public relations strained in Hawai'i due to land leases, groundwater contamination at the Red Hill facility, and ongoing friction from the illegal overthrow of the Hawaiian monarchy, among other issues. In Hawai'i, 5.6% of the state land is leased to the military, the highest proportion of any state.³⁹⁶ Historically, these leases have been far less than market value. In 1964, agreements were made to lease large tracks of land to the military for 65 years, with a total cost of \$1 per lease. These leases are set to expire in 2029 and are currently being renegotiated at more appropriate rates that reflect market value. This will provide Hawai'i with a revenue stream, which State agencies may use to implement critically needed climate mitigation and adaptation actions.

Military GHG contributions

In 2021, the military in Hawai'i contributed an estimated 887,903 MTCO_{2e}, or 6.79% of greenhouse gas emissions.³⁹⁷ Making the military the fourth largest GHG contributor in Oah'u county, next to energy industries, which produce electricity (39.86%), air transportation (18.6%), and ground transportation (17.9%). As one of the top contributors of greenhouse gases the military have a responsibility to help the state mitigate greenhouse gases and implement

³⁹⁵Hawaii Defense Economy -A Community and Business Resource, accessed July 25, 2025. <https://defenseeconomy.hawaii.gov>

³⁹⁶"How Much Land does the U.S. Military Control in Each State", accessed July 25, 2025. <https://www.visualcapitalist.com/how-much-land-does-the-u-s-military-control-in-each-state/>

³⁹⁷ One Climate One O'ahu Accelerating O'ahu's clean energy future for our communities aina, economy. Climate Action Plan 2020-2025, accessed July 25, 2025. <https://www.resilientoahu.org/climate-action-plan>

projects to adapt to and prepare for the impacts of climate change in Hawai‘i. If Hawai‘i is to reach our climate goals, it must be done in conjunction with and with support from the Department of Defense (DOD).

Current actions

The US Dept of Defense Readiness and Environmental Protection Integration Program (REPI) is the primary method by which the DoD has funded climate-related projects in Hawai‘i. The DoD has contributed over \$48 million in REPI projects in Hawai‘i from FY 2006-2024.³⁹⁸ These projects include preserving Pūpūkea Paumalu as open space, mitigation of wildfire threat on Oahu in lands adjacent to Army installations, Honouliuli Preserve, protection of drinking water resources, erosion control, flood mitigation, improving water quality and protecting habitat quality for threatened and endangered species in lands surrounding the Wahiawa Annex on Oahu, as well as predator control and habitat restoration for threatened and endangered sea birds at the Barking Sands Pacific Missile Range.^{399, 400, 401}

The military has also been assisting the state in advancing sustainable energy goals by transitioning military family homes and base operations to sustainable energy systems. The Army assisted in installing renewable energy systems at 200 military homes on the Aliamanu Military Reservation.⁴⁰² The military has a biofuel 50-MW power-generating station at Schofield, is developing a sustainable microgrid at Joint Base Pearl Harbor-Hickam, and has installed solar PV systems across 15 Ohana military communities, implemented energy efficiency measures in military communities including, Halsey, Radford, McGrew, Hokulani, Hale Moku, Ford Island, Catlin Park, Haele Maui, Doris Miller, Pa Honua, Mololani, Waikulu, Heleloa, and Ulupau, generating 15.7MW of rooftop solar energy.⁴⁰³ In addition, Project PEARL is the first of six

³⁹⁸ Readiness and Environmental Protection Integration Program 2024. 18th Annual Report to Congress, accessed July 25, 2025.

https://www.repi.mil/Portals/44/Documents/Reports_to_Congress/2024_REPI_Report_to_Congress.pdf

³⁹⁹ REPI Project Profiles. U.S. Army Garrison-Hawaii, accessed July 25, 2025.

https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Army/USAGH.pdf#:~:text=An%20important%20platform%20for%20the%20Pacific%20theater%2C,soldiers%20in%20support%20of%20combat%20operations%20and.

⁴⁰⁰ REPI Project Profiles U.S. Navy, U.S Air Force Joint Base Pearl Harbor-Hickam.accessed July 25, 2025.

https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Joint%20Bases/JBPHH_v2.pdf

⁴⁰¹ REPI Project Profiles U.S. Navy, Pacific Missile Range Facility Barking Sands July 25, 2025.

[/https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Navy/PMRF_BarkingSands.pdf](https://www.repi.mil/Portals/44/Documents/Buffer_Fact_Sheets/Navy/PMRF_BarkingSands.pdf)

⁴⁰² "Powering the Future: Army Hawaii, Holu Hou Energy, and Lendlease Launch Innovative Renewable Energy Project", accessed July 25, 2025.

https://www.army.mil/article/281977/powering_the_future_army_hawaii_holu_hou_energy_and_lendlease_launch_innovative_renewable_energy_project#:~:text=ALIAMANU%20MILITARY%20RESERVATION%2C%20Hawaii%20%E2%80%93%20U.S.,strain%20on%20O%20CA%20BBahu's%20electrical%20grid.

⁴⁰³ U.S. Army Garrison Hawaii Energy Resiliency Program Wins FEMP Award, accessed July 25, 2025.

<https://www.energy.gov/femp/us-army-garrison-hawaii-energy-resiliency-program-wins-femp-award#:~:text=USAG%20DHI%20increased%20its%20on,in%20wind%20and%20PV%20generation.>

planned solar microgrids, and U.S. Army Garrison Hawai‘i tripled its renewable energy generation^{404, 405}

14.3 Recommendations

There is an opportunity for the Military operations in Hawai‘i to expand climate mitigation and adaptation projects in Hawai‘i through infrastructure improvements, funding, providing technical expertise, and proactively mitigating and responding to extreme weather events.

The Department of Defense Climate Adaptation Plan 2024-2027 identifies climate resilience planning, infrastructure hardening, and investing in renewable energy and microgrids as critical actions to take to adapt to the impacts of climate change.⁴⁰⁶ Infrastructure improvements are one of the significant overlaps in program goals for the State of Hawai‘i and military installations. They are needed across the state due to sea level rise, an increase in severe storm events, and coastal flooding. Better coordination and collaboration between state, county and military projects will leverage resources and reduce costs.

Military installations house a variety of skilled staff who can provide training and technical expertise for a diverse array of climate-related projects, from renewable energy, landscape engineering and restoration, disaster response, and more. The military can take the opportunity to collaborate with the State on climate-related projects, which would improve public opinion and the military’s standing in Hawai‘i and help alleviate bottlenecks in project implementation. By working closely with the state, the military forces present in Hawai‘i can help shape a more equitable and sustainable future for Hawai‘i Nei.

⁴⁰⁴ "Project Pearl: Sustainable microgrid to deliver energy assurance", accessed July 25, 2025.

<https://www.nationalguard.mil/News/Article-View/Article/2045066/project-pearl-sustainable-microgrid-to-deliver-energy-assurance/#:~:text=%22The%20PEARL%20project%20is%20the,Center%20for%20Advanced%20Transportation%20Technologies>.

⁴⁰⁵ "Hunt Military Communities Expands On Leading Solar Initiative In Hawaii", accessed August 30, 2025.

<https://www.ohananavycommunities.com/news/hunt-military-communities-expands-on-leading-solar-initiatives-in-hawaii#:~:text=Ohana%20Military%20Communities%20has%20invested,with%20Hawaii's%20historic%20preservation%20offices>.

⁴⁰⁶ Department of Defense Climate Adaptation Plan, 2024-2027, accessed August 30, 2025.

<https://www.sustainability.gov/pdfs/dod-2024-cap.pdf>



15. Low-Income and Disadvantaged Community (LIDAC) Analysis

Introduction

Low-income households produce the least GHG emissions, yet they disproportionately bear the impacts of climate change. National-level data offers a stark illustration: a 2023 study published in PLOS Climate found that the top 10% of U.S. earners are responsible for approximately 40% of total U.S. greenhouse gas emissions, while the top 1% alone account for 15 to 17%. It is not just actions of the 1% that create emissions but also their investment-based activities, such as stakes in fossil fuel-intensive industries. For the top 1%, an estimated 38–43% of emissions are from investments rather than day-to-day consumption, highlighting the role of capital and profits in driving climate change.⁴⁰⁷

⁴⁰⁷ Oswald, Y., Owen, A., & Steinberger, J. K. (2023). The US income-emissions inequality nexus: A multi-dimensional analysis. PLOS Climate, 2(6). <https://doi.org/10.1371/journal.pclm.0000190>

Low-income households produce the least GHG emissions, yet they disproportionately bear the impacts of climate change. National-level data offers a stark illustration: a 2023 study published in *PLOS Climate* found that the top 10% of U.S. earners are responsible for approximately 40% of total U.S. greenhouse gas emissions, while the top 1% alone account for 15 to 17%. It is not just actions of the 1% that create emissions but also their investment-based activities, such as stakes in fossil fuel-intensive industries. For the top 1%, an estimated 38–43% of emissions are from investments rather than day-to-day consumption, highlighting the role of capital and profits in driving climate change.⁴⁰⁸

Globally, the disparity is even more extreme. The bottom 50% of the world's population contributes just 12% of emissions, while the top 10% is responsible for nearly half (48%). The wealthiest 1% emit more than the bottom five billion combined.⁴⁰⁹ These figures underscore the degree to which wealth is inextricably linked to carbon intensity. As income increases, so too does an individual's carbon footprint, due not only to greater consumption of goods and services but also to the carbon embedded in financial assets and luxury lifestyles.

These insights have implications for Hawai'i's low income and disadvantaged communities (LIDAC) which shoulder some of the highest energy burdens in the nation.⁴¹⁰ In Hawai'i's tropical climate, higher-income families often maintain large, energy-intensive homes with multiple air-conditioning units running for hours daily, which increases electricity demand and drives emissions beyond what is captured by per-capita averages. Meanwhile, low-income households face unique hardships in this same environment. Wealthier households also tend to contribute significantly more to GHG emissions through frequent airline travel, increased vehicle ownership, and increased consumption and waste.

For LIDAC households in Hawai'i, the combination of low emissions, high costs, and rising vulnerability to climate impacts demands an intentional and equity-centered response. Mitigation and adaptation strategies must acknowledge that the wealthiest households not only contribute disproportionately to emissions but also often have the resources to insulate themselves from the consequences of climate change while low-income households are left exposed and overburdened, with few options to adapt. The implementation of the measures included in this CAP will significantly benefit low-income and disadvantaged communities by driving down energy costs and providing support for vulnerable households. This chapter outlines how the CAP identified LIDAC communities and how our state intends to ensure that the benefits of CAP measures flow equitably to these communities.

⁴⁰⁸ Oswald, Y., Owen, A., & Steinberger, J. K. (2023). *The US income-emissions inequality nexus: A multi-dimensional analysis*. *PLOS Climate*, 2(6). <https://doi.org/10.1371/journal.pclm.0000190>

⁴⁰⁹ Chancel, L. (2022). *Global Carbon Inequality Over 1990–2019*. *Nature Sustainability*, 5, 931–938. <https://doi.org/10.1038/s41893-022-00955-z>

⁴¹⁰ Hawai'i State Department of Business, Economic Development & Tourism (DBEDT). (2023). *Electricity Burdens on Hawai'i Households*. Honolulu, HI: Research & Economic Analysis Division. Retrieved from https://files.hawaii.gov/dbedt/economic/data_reports/reports-studies/Electricity_Burdens_on_Hawai%E2%80%99i_Households_Jan_2025.pdf Sierra Club Hawai'i. (2021). *Energy Justice in Hawai'i*. <https://sierraclubhawaii.org/blog/ej-heco-july2021>

Context for Hawai‘i’s LIDAC Methodology

Hawai‘i’s unique geographic, economic, and social context necessitates a localized approach for identifying LIDACs. Vulnerability data in Hawai‘i is often difficult for communities, agencies, and decision-makers to access or use effectively. Census datasets can be hard to interpret, especially for small or rural communities where socioeconomic conditions vary significantly within a single tract. Stakeholders consistently emphasized the need for more localized, community-scale mapping tools that present data in a clear and accessible way. As a state, Hawai‘i is working to improve the availability and usability of vulnerability information by developing more comprehensive and high-resolution tools that support planning, resource allocation, and equitable implementation of CAP measures.

Given these constraints, Hawai‘i has adopted a customized methodology rooted in local data sources that more accurately reflect the socioeconomic and environmental realities faced by our frontline communities. Our approach sought to identify LIDACs using more granular, high-resolution data than national-level screening tools provide, in order to more accurately capture the localized conditions and diverse characteristics of Hawai‘i’s communities.

Methodology for Identifying LIDACs

LIDAC communities were identified census data from United for ALICE (Asset Limited, Income Constrained, Employed), Hawai‘i’s Coastal Zone Management Program’s (CZM) Social Vulnerability Indicator (SVI) and two county-level vulnerability assessments. Mapping for Kaua‘i used the SVI mapping and vulnerability analysis provided in the Kaua‘i CAP Vulnerability and Equity Analysis.⁴¹¹ O‘ahu’s mapping used the City and County of Honolulu’s O‘ahu Social Vulnerability Index developed by the Office of Climate Change, Sustainability, and Resilience.

United for ALICE provides a measure of financial hardship beyond traditional poverty metrics by identifying households that fall short of the basic income needed to afford essential living cost. ALICE data were available at the County Subdivision (CCD) and Census Designated Place (CDP) level. For this analysis, communities where more than 50% of households were classified as ALICE, in poverty, or both were treated as meeting the “low-income” criterion for LIDAC designation.

The ALICE data was paired with CZM’s 2020 SVI dataset to acquire a broader measure of social and demographic vulnerability. This dataset identifies Census tracts with vulnerability indicator counts at or above the 75th percentile statewide. It includes demographic, economic, and social variables associated with barriers to preparing for, responding to, or recovering from coastal hazards. For this analysis tracts were classified as socially vulnerable if they had an SVI Indicator Count of 6 or higher.

⁴¹¹ County of Kaua‘i. (2022). Kaua‘i Climate Adaptation Plan, Vulnerability and Equity Analysis <https://kauaiadaptation.com/impacts/>

The O‘ahu Climate Change Resilience Strategy incorporates socioeconomic and climate vulnerability indicators. Communities categorized as "High" or "Very High" vulnerability were classified as LIDACs for this analysis.⁴¹² Using Kaua‘i’s SVI maps, communities with a Social Vulnerability Index score above the 0.6 percentile were designated as LIDACs. These maps were then compared to the tracts identified through the ALICE + statewide SVI methodology. Where the local studies identified areas not captured through the broader criteria they were incorporated into the final list. This approach ensures that the analysis reflects both statewide quantitative indicators and locally developed assessments that may capture socioeconomic, cultural, or environmental factors not represented in statewide datasets. Integrating both sources results in a more comprehensive and locally relevant identification of LIDAC communities for the CAP.

Wherever possible LIDAC analysis identified communities down to the level of Census Designated Places (CDPs) to enhance the resolution of analysis. This granularity will also allow for targeted outreach in the future, enabling meaningful engagement with each community about their climate priorities and the ways in which CAP measures may be implemented. Recognizing that the quantitative portion of the LIDAC benefits analysis may operate at a broader resolution than CDPs due to data and modeling limitations this list will serve as the foundational community inventory for that work and for ongoing outreach.

Hawaiian Home Lands

As part of this effort, the State recognizes the need to expand and strengthen participation of Native Hawaiian beneficiaries in community resilience planning. Some DHHL communities have expressed that current State planning processes do not consistently reach or reflect the breadth of beneficiary perspectives, particularly those living on homestead lands or on waitlists. Identifying more culturally grounded, accessible, and community-led methods for participation will be essential to ensuring that resilience strategies align with beneficiary needs and priorities. All Department of Hawaiian Home Lands (DHHL) tracts across the state were automatically included in the LIDAC definition. The State will continue to reach out to the Department of Hawaiian Home Lands (DHHL) and homestead associations to support deeper engagement and co-development of planning processes, tools, and resilience initiatives.

LIDAC Mapping

The map below reflects the broader analytical scale used for the quantitative LIDAC Benefits Assessment. Due to data availability and methodological consistency across counties, this analysis is conducted at the Census block level, allowing the integration of multiple statewide indicators, including ALICE household burden, SVI scores, and Hawaiian Home Lands boundaries into a unified spatial assessment. The resulting LIDAC tract map ensures that all communities meeting any of the vulnerability criteria are captured, even where CDP boundaries or naming conventions

⁴¹²City and County of Honolulu. (2018). O‘ahu Social Vulnerability Index https://static1.squarespace.com/static/5e3885654a153a6ef84e6c9c/t/5f10eaf7cb44284ef9c93e4d/1594944287505/OI_a_Oahu_Resilience_Strategy.pdf

differ. A comprehensive list of the LIDAC communities is included in Appendix B: List of LIDAC Communities in Hawai‘i.

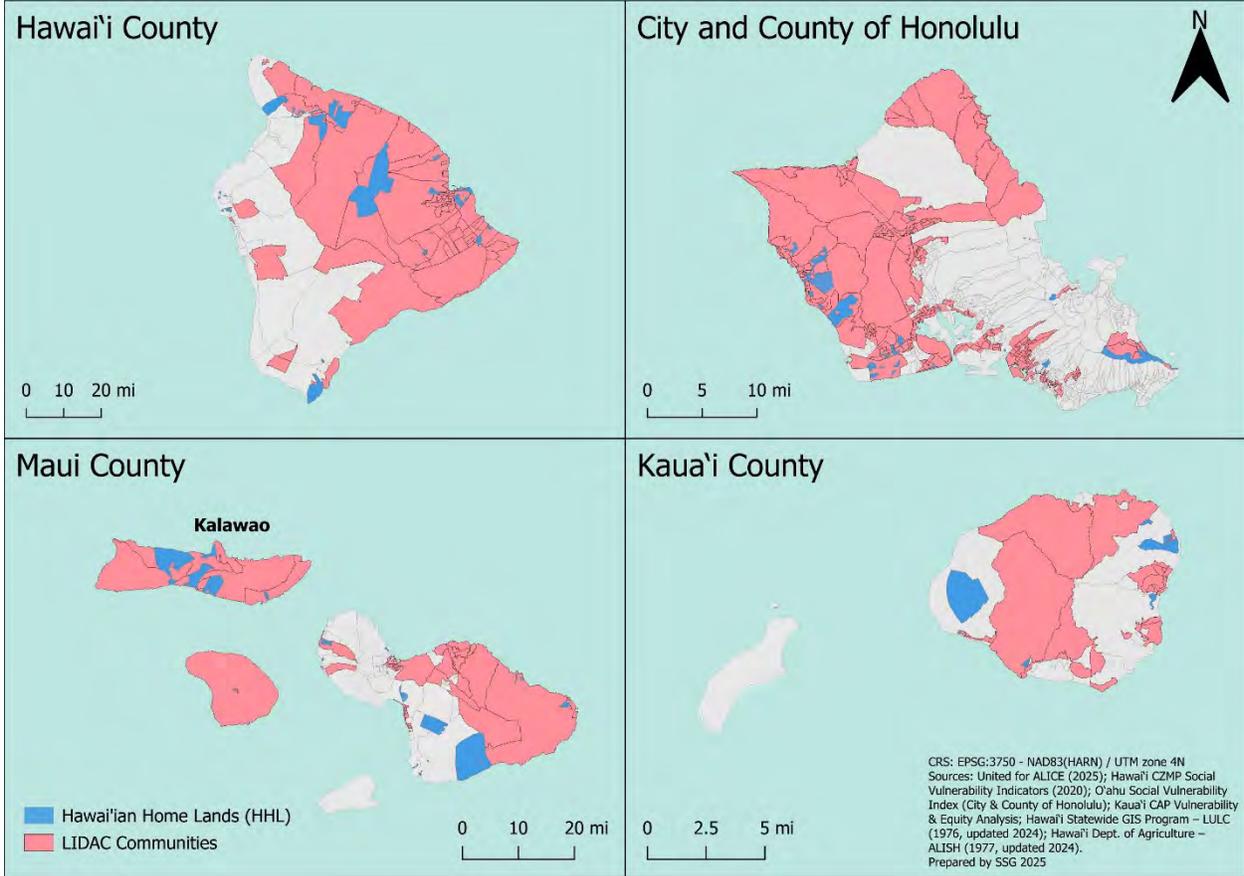


Figure 46: LIDAC communities across the State of Hawai‘i. A detailed inset highlights conditions on O‘ahu, where tract density and demographic variation are highest.

Impact of CAP Implementation on LIDACs

The broader societal impacts of GHG mitigation measures, such as potential positive (co-benefits) or negative (co-harms) are not equally distributed and are often difficult to clearly determine and assess, as their relevance encompasses different areas of concern, such as technology, income distribution, economic market, energy, health, environment, climate adaptation and resilience.

The Intergovernmental Panel on Climate Change (IPCC) defines co-benefits as “the positive effects that a policy or measure aimed at one objective might have on other objectives, irrespective of the net effect on overall social welfare.” In this analysis, co-benefits are assumed to be any potential or anticipated benefits of the measure in addition to its impact on GHG emissions. Examples of co-benefits of reducing GHG emissions are shown in the following figure.

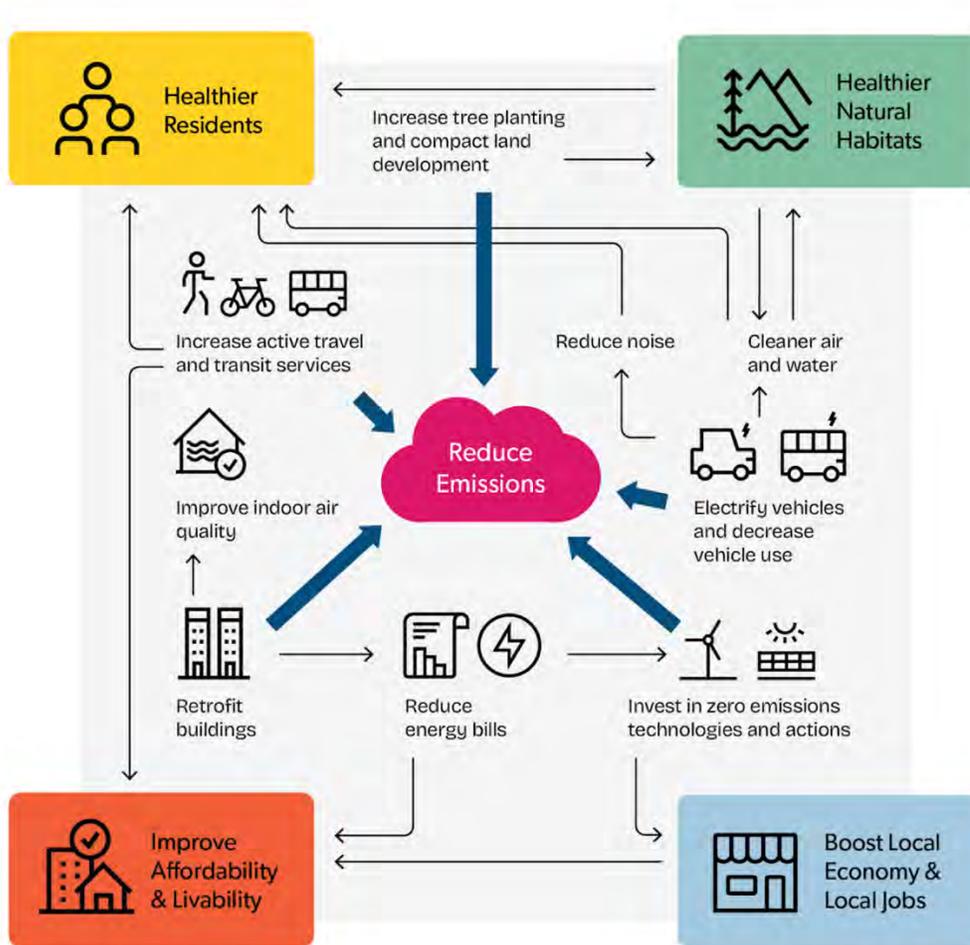


Figure 46: Depiction of how emissions reductions have various co-benefits.

While many GHG reduction measures have positive effects, there is also potential for co-harms and the creation of negative feedback cycles. For example:

- Compact urban development reduces emissions, but without careful design, there is a risk that people, including children and the elderly, will be exposed to elevated levels of air pollutants as they walk or cycle in close proximity to traffic increasing the need for faster adoption of electric vehicles.
- Infrastructure to reduce emissions requires major investments, and the income distributional effects of those investments may impact those households with lower incomes without guardrails to protect them.
- Increased costs in urban centers may result in increased lower-cost housing at the edge of cities or outside of their boundaries, leading to an increase in transportation emissions and congestion.
- An increase in transportation electrification may lead to a displacement of increased emissions, particularly in the absence of policies related to renewable electricity

generation. This may cause negative impacts to those households residing in the vicinity of electricity-generating facilities.

The positive, or negative, effects are often unintentional and specific to local contexts, but measures that reduce emissions can be implemented in ways that increase positive co-benefits and mitigate or avoid negative ones. This can be achieved through careful policy design that considers and prioritizes GHG emissions alongside other impacts. Co-benefits and co-harms were assessed broadly and qualitatively, considering economic prosperity, energy poverty, employment opportunities, indoor air pollution and physical and emotional wellbeing.

An important consideration in GHG transition is the household energy expenditures. Technologies and energy sources can increase or decrease household energy expenditures, which particularly impacts households with a high energy burden. A household faces a high energy burden when it spends more than 6% of its income on energy and a severe energy burden when it spends more than 10% of its income on energy, as defined by the U.S. Department of Energy. Households in Hawai‘i have, on average, the highest electricity costs, compared to the rest of the US.⁴¹³ While the average household electricity burden in Hawai‘i was 2.1%, extremely low-income households, who earn less than 30% of Area Median Income (AMI), spent 13.9% of their income on electricity bills.⁴¹⁴ This worsens in households with incomes below the Federal Poverty Level (FPL), who spent 19.5% of their income on electricity costs. Households experiencing severe energy burdens comprise almost a quarter of the households in Hawai‘i.⁴¹⁵

Installing solar power can partly offset electricity costs and energy efficiency through retrofitting homes, installing solar water heaters and new appliances, can decrease energy consumption in households, decreasing the energy burden in low-income households in Hawai‘i. Transportation actions, such as switching modes and electrifying vehicles can also help reduce LIDAC burdens. However, upfront costs can make actions inaccessible to some households, and it is important to set up the right policies and programs so low-income households can implement measures in order to access cost savings and reduce their energy burden.

Climate adaptation efforts must also operate at the family and neighborhood levels, particularly in LIDAC communities where vulnerabilities are most acute and resources for large-scale household upgrades are limited. Household and block-level resilience strategies such as neighborhood preparedness networks, localized cooling solutions, microgrid-ready homes, and community disaster response training are essential complements to broader infrastructure investments. Community members emphasized that adaptation strategies must be designed in ways that support families directly where they live and strengthen neighborhood cohesion, not only city- or county-

⁴¹³ Kamita, R. (2025). *Electricity Burdens on Hawai‘i Households: 2022 Update*. Research and Economic Analysis Division, Department of Business, Economic Development & Tourism.

https://files.hawaii.gov/dbedt/economic/data_reports/reports-studies/Electricity_Burdens_on_Hawai%E2%80%99i_Households_Jan_2025.pdf

⁴¹⁴ Kamita, R. (2025). *Electricity Burdens on Hawai‘i Households: 2022 Update*. Research and Economic Analysis

⁴¹⁵ Kamita, R. (2025). *Electricity Burdens on Hawai‘i Households: 2022 Update*. Research and Economic Analysis

level systems. Ensuring that LIDAC neighborhoods have the tools, support, and resources to build resilience at these scales is a critical to equitable climate adaptation.

Conclusion

Ensuring LIDACs are not only not left behind but are a part of the process of climate change action development and implementation will require significant investments in time, outreach and community support. Hawai‘i cannot move forward without the trust of communities especially those who will be most impacted by climate change. Through thoughtful policies, agency collaboration, and innovative and thorough community outreach the State can uplift LIDAC communities while achieving a healthy, safe, affordable and resilient Hawai‘i.



16. Climate Change and Health in Hawai'i

Introduction

Climate change is one of the most pressing public health challenges of our time. Across Hawai'i, rising temperatures, shifting rainfall patterns, stronger storms, and environmental degradation are already altering the conditions in which people live, work, and thrive. These changes have direct and indirect effects on health, from heat-related illness and respiratory disease to food insecurity, displacement, and psychological stress. The State's unique geographic isolation, dependence on imports, high cost of living, and cultural ties to land and ocean amplify its vulnerability.

The purpose of this chapter is to examine the intersection of climate change and health in Hawai‘i, highlight the issues most relevant to public health, identify actions already underway, and propose evidence-based recommendations for protecting communities. It examines 12 topic areas (image below) and cross cutting recommendations for addressing each area of concern.

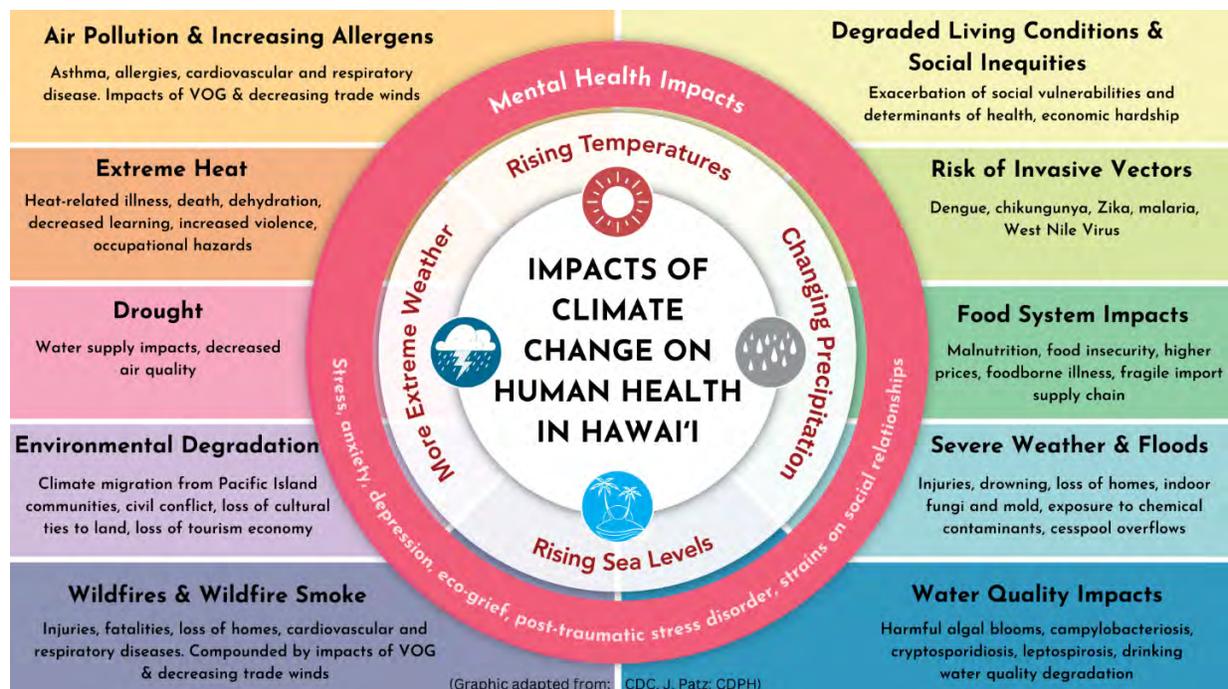


Image developed by Hawai‘i Department of Health.⁴¹⁶

16.1 Climate Change and Health Issues, Gaps and Recommendations

Extreme Heat

Hawai‘i’s temperatures have climbed by about 0.3°F per decade and are projected to increase by 2–4°C by 2100.⁴¹⁷ The decline in trade winds and the growth urban landscapes have led to the urban heat islands effect where intensifying heat exposure is experienced in urban areas.⁴¹⁸ The inequity of tree locations, the high cost of electricity and the construction of homes built for ventilation, not mechanical cooling such as air conditioning, make the heat island effect particularly challenging for LIDAC families in Hawai‘i.

Heat stress leads to dehydration, kidney injury, and heat stroke, and exacerbates chronic diseases like heart failure, asthma, and diabetes. It also affects mental health, with studies linking prolonged

⁴¹⁶ Hawai‘i Department of Health. <https://health.hawaii.gov/heer/climate-and-health/>

⁴¹⁷ Giambelluca, T. W., Diaz, H. F., & Luke, M. S. A. (2008). *Secular temperature changes in Hawai‘i*. *Geophysical Research Letters*, 35(12), L12702. <https://doi.org/10.1029/2008GL034377>

⁴¹⁸ National Integrated Heat Health Information System (NIHHIS) website. Accessed December 9, 2025 <http://heat.gov/urban-heat-islands/>

heat exposure to anxiety, aggression, and suicide.⁴¹⁹ Kūpuna, keiki, outdoor workers, and houseless residents are most at risk. Rising temperatures can make classrooms and athletic fields unsafe for keiki, particularly in older school buildings that lack adequate ventilation or shade. Student athletes face heightened risk of heat exhaustion or heat stroke during outdoor practices and games. Workers in construction, agriculture, and other heat-exposed industries experience reduced productivity and increased risk of occupational illness. Extreme heat can make multimodal transportation challenging. A Naalehu resident shared "In Naalehu the Monkey pods that completely shaded Naalehu main street have been trimmed back to nubs. Naalehu main Street is no longer in the shade for pedestrians." These impacts underscore the need for standardized heat response protocols across schools, athletic programs, and workplaces to protect Hawai‘i’s students and workforce as temperatures continue to climb.

Current Gaps

Hawai‘i has taken early steps to address heat risk, such as DOE athletic-safety guidelines and a few local cooling-center pilots through Honolulu’s Office of Climate Change, Sustainability, and Resiliency. However, there is still **no statewide framework** for extreme heat response or occupational safety. Cooling centers and resilience hubs are unevenly distributed across islands, leaving rural and houseless populations especially vulnerable. Schools and athletic programs lack standardized monitoring or equipment to enforce heat safety, and many early-learning facilities still have inadequate outdoor shade. There are also **no clear heat-response triggers** to guide when counties should open cooling or clean-air rooms. Collectively, these gaps underscore the need for statewide coordination, worker protections, and data-informed action thresholds.

Recommendations

1. **Expand Community Cooling Centers and Outreach to Houseless Populations** - Cooling centers provide immediate protection during heat waves, particularly for kūpuna, unhoused individuals, and households without air conditioning, and can reduce heat-related hospital visits.⁴²⁰ Designated cooling centers such as public libraries, schools, and resilience hubs, equipped with clean air, cold water, and emergency power are needed.
2. **Develop Urban Tree Canopy** - Investing in urban tree planting can lower neighborhood temperatures by several degrees and reduce heat stress for pedestrians, students, and outdoor workers. This is especially important in resource-constrained communities where home air-conditioning may not be a viable option. Increasing capacity and funding is needed for counties and community organizations to install and maintain urban trees.
3. **Comprehensive Heat Response Plans for Schools and Sports** – Coordination between The DOE and HDOH to standardize the Hawai‘i High School Athletic Association’s Heat Acclimatization Guidelines, provide supportive heat monitoring devices and a statewide

⁴¹⁹ Burke, M., González, F., Baylis, P., Heft-Neal, S., Baysan, C., Basu, S., & Hsiang, S. (2018). Higher temperatures increase suicide rates in the United States and Mexico. *Nature Climate Change*, 8(8), 723–729. <https://doi.org/10.1038/s41558-018-0222-x>

⁴²⁰ Environmental Protection Agency (EPA). (2023). *Heat Islands and Equity*. <https://www.epa.gov/heatislands/heat-islands-and-equity>

assessment of outdoor shade availability especially at early childhood and preschool facilities is needed.

4. **“Be a Buddy” Programs** - Heat mortality often occurs among isolated individuals. Hawai‘i could establish neighborhood networks modeled after New York City’s “Be a Buddy” program that encourage residents to check in on at-risk neighbors, particularly elderly individuals, people living alone, and households without reliable cooling. Programs can be managed through community associations or resilience hubs, reinforcing social cohesion while reducing preventable heat-related deaths.
5. **Advocate for Inclusion of Hawai‘i data in CDC HeatRisk Map** - The CDC’s national HeatRisk Map tool currently lacks Hawai‘i-specific data. State advocacy for inclusion so that local decision-makers, health agencies, and the public have accurate early-warning information tailored to Hawai‘i’s climate is needed.
6. **Farmworker Protections** - Establish a Hawai‘i Outdoor Heat Illness Prevention Standard to protect agricultural workers from dangerous heat exposure. The policy should set clear temperature-based action levels, require access to shade, rest, and cool drinking water, and ensure paid breaks and acclimatization periods during high heat. Employers should provide bi-annual multilingual training, maintain emergency response plans, and allow workers to report violations without retaliation.
7. **Adopt Heat-Response Triggers and Cooling Access Protocols** - Adopt clear triggers for action on very hot days, such as a forecast of several consecutive days with dangerous heat and track how often these actions occur and whether heat-related emergency room visits are reduced as a result.

Air Pollution and Increasing Allergens

Air quality in Hawai‘i is influenced by volcanic emissions (vog), wildfire smoke, vehicle exhaust, industrial processes, and airborne allergens. While prevailing trade winds help disperse pollutants and maintain generally good air quality, communities located near emission sources such as industrial facilities, major roadways, and active volcanoes experience harmful short-term exposures. Fine particulate matter (PM_{2.5}), nitrogen oxides (NO_x), and sulfur oxides (SO_x) from these sources contribute to respiratory and cardiovascular diseases, irregular heartbeat, aggravated asthma, and reduced lung function. Vog from Kīlauea has been linked to spikes in asthma and heart-disease hospitalizations,⁴²¹ and the 2023 Maui wildfires demonstrated how quickly smoke can envelop communities, exposing thousands to dangerous particulates. Rising temperatures also increase ground-level ozone and lengthen pollen seasons, compounding risks for people with asthma, COPD, heart conditions, and for children and pregnant individuals. Decarbonizing vehicle fuels through the use of E85 fuel bring lower GHG emissions as well as harmful toxic pollutants such as benzene, which is a known carcinogen. An identified co-harm though are acetaldehyde

⁴²¹ Longo, B. M., Yang, W., Green, J. B., Crosby, F. L., & Crosby, V. L. (2010). Acute health effects associated with exposure to volcanic air pollution (vog) from increased activity at Kilauea volcano in 2008. *Journal of Toxicology and Environmental Health, Part A*, 73(20), 1370–1381. <https://doi.org/10.1080/15287394.2010.497440>

emissions of this fuel, under certain engine conditions⁴²² (sold engine start), also a carcinogen and a moderate contributor to the formation of ground level ozone.⁴²³ Promoting a transition from personal vehicle use to public transportation or other active modes of transportation can lead to increased physical activity and a healthier lifestyle, reducing the relative risk of premature mortality by 30 - 40%.⁴²⁴ Also, studies have consistently shown that regular physical activity improves overall health, mental health and fitness, reduces many chronic diseases and contributes to happiness and decreased anxiety.^{425, 426}

Current Gaps

The DOH Clean Air Branch and EPA Region 9 maintain most of Hawai‘i’s permanent air-quality monitoring stations on O‘ahu and Hawai‘i Island, where data collection is strongest. After the 2023 Maui wildfires, additional sensors and N95 mask distribution improved short-term monitoring capacity. Yet air-quality data remain sparse in rural and neighbor-island communities, and Hawai‘i lacks a comprehensive system for tracking allergens or communicating localized risks. Existing outreach does not reach all language groups or residents without internet access. Furthermore, while trade winds typically help disperse pollution, acute exposure near emission sources such as industrial areas, highways, and volcanic vents remains a significant health threat. Addressing these gaps requires expanding monitoring networks, developing public education materials, creating an allergen registry, and equipping community shelters and resilience hubs with clean-air capabilities.

Recommendations

1. **Clean-Air Shelters and Equipment** - During wildfire or vog events, clean-air shelters equipped with HEPA filtration and stocked with portable purifiers and N95 masks can prevent respiratory crises. Supporting community resilience hubs in providing this service could promote equitable access.
2. **Centralized Allergen Registry** - Creating an allergen registry to catalog pollen-producing species and seasonal trends enables healthcare providers to anticipate asthma spikes. Hawai‘i’s mix of endemic and invasive flora creates unique allergen exposures; tracking them helps inform urban-planting choices and guide patient counseling⁴²⁷.

⁴²² Comparison of Emissions of Conventional and Flexible fuel Vehicles Operating on Gasoline and E85 Fuels. https://gaftp.epa.gov/Air/emismod/SPECIATE_supportingdata/v4_2/E-85%20and%20gasoline%20fuels%20exhaust%20comparison%2005-39%20FFV%20Report%20-%20Final.pdf

⁴²³ <https://afdc.energy.gov/vehicles/flexible-fuel-emissions>

⁴²⁴ U.S. Department of Transportation. *Active Transportation and Health*.

<https://www.transportation.gov/mission/health/active-transportation-and-health>.

⁴²⁵ World Health Organization. *Physical Activity*. <https://www.who.int/news-room/fact-sheets/detail/physical-activity>.

⁴²⁶ Mayo Clinic Staff. *Exercise: 7 Benefits of Regular Physical Activity*. Mayo Clinic.

<https://www.mayoclinic.org/healthy-lifestyle/fitness/in-depth/exercise/art-20048389>.

⁴²⁷ Miller, A. E., Watanabe, M. E., & Brosi, B. J. (2015). Pollen carried by native and nonnative bees in the large-scale reforestation of pastureland in Hawai‘i: Implications for pollination. *Pacific Science*, 69(1), 67–79.

<https://doi.org/10.2984/69.1.5>

3. **Public Education Materials** - Clear, multilingual brochures and public education materials on air quality risks related to wildfires, including guidance on exposure reduction, use of clean-air spaces, and proper mask use during smoke events will help to reduce risk. Public education can leverage trusted messengers including nurses, schools, churches, and community leaders to reach high-risk populations.
4. **Increase Air Quality Monitoring in Communities Near Geothermal Energy Sites** - Residents in such areas have expressed concern about hydrogen sulfide (H₂S) and other emissions. Publicly accessible data integrated into the state's air quality dashboard would improve transparency and health response.

Drought

Long-term rainfall declines have left much of Hawai'i drier, with some areas experiencing a 60 percent reduction in dry-season precipitation⁴²⁸. Drought compromises drinking-water availability, stresses crops and livestock, increases dust and wildfire risk, and heightens mental strain among farmers. Water scarcity can degrade hygiene and sanitation, leading to gastrointestinal or skin infections, while concentrated contaminants in stagnant water elevate leptospirosis and mosquito-borne disease risk.

Current Gaps

The 2017 Hawai'i Drought Plan⁴²⁹ provides a framework for coordination, and county water departments promote voluntary conservation. Watershed partnerships have fenced and reforested uplands to enhance water recharge, but health and equity dimensions of drought including sanitation, hygiene, and farmer mental stress remain underrepresented in planning. Drought preparedness still depends heavily on voluntary measures rather than enforceable water-use standards. Zoning and permitting processes seldom account for long-term water scarcity, allowing water-intensive developments in vulnerable regions. Nonessential uses, such as ornamental landscaping and golf-course irrigation, consume substantial water with limited oversight. Hawai'i also lacks consistent support for greywater reuse, rainwater harvesting, or large-scale water-smart conservation initiatives.

Recommendations

1. **State Drought Plan Update and Integration of Health Objectives** - Update the 2017 DLNR Hawai'i Drought Plan to reflect current climate projections, support water reuse and conservation, and incorporate health and equity in collaboration with DOH.

⁴²⁸ Frazier, A. G., & Giambelluca, T. W. (2016). Spatial trend analysis of Hawaiian rainfall from 1920 to 2012. *International Journal of Climatology*, 37(5), 2522–2531. <https://doi.org/10.1002/joc.4862>

⁴²⁹ Hawai'i Department of Land and Natural Resources (DLNR). (2017). *Hawai'i Drought Plan 2017 update*. Commission on Water Resource Management, State of Hawai'i. <https://dlnr.hawaii.gov/cwrm/planning/drought/>

2. **Water-Efficient Land Use and Zoning** - Adopt zoning and permitting policies that restrict water-intensive development in drought-prone areas and require water-smart landscaping and construction practices for new projects.
3. **Reevaluate Non-Essential Water Use** - Reassess water usage for non-essential activities such as golf courses and ornamental landscaping, encouraging efficiency standards, reuse systems, and drought-tolerant vegetation to reduce strain on potable water supplies.
4. **Greywater Recycling and Water Conservation Programs** - Expand county and state programs that promote greywater recycling, rainwater harvesting, and efficient irrigation. Strengthen public engagement through Board of Water Supply “WaterSmart” initiatives to encourage household and business-level conservation.

Environmental Degradation

Sea-level rise, coastal erosion, and flooding threaten more than 1,000 known contaminated sites across Hawai‘i⁴³⁰. Toxins from petroleum, heavy metals, and pesticides could leach into aquifers and nearshore waters, posing long-term risks of cancer and developmental disorders. Coral-reef loss and sediment runoff degrade fisheries and coastal protection, while the deterioration of ‘āina affects mental and cultural wellbeing. For many Native Hawaiians, environmental decline is inseparable from spiritual and ancestral loss.

Current Gaps

HDOH’s Hazard Evaluation and Emergency Response (HEER) office and UH Sea Grant have mapped contaminated coastal sites vulnerable to sea-level rise. However, these maps are not yet integrated into statewide or county land-use planning. Remediation funding remains reactive rather than preventive and there is no dedicated funding stream for cleaning up or relocating hazardous facilities in flood-prone areas. While community and biocultural restoration projects such as lo‘i and loko i‘a revitalization improve ecological health, they operate on limited grants and fragmented support. The needs of climate migrants displaced from other Pacific Island nations are also not well integrated into Hawai‘i’s health or social-service planning. Increasing funding for primary care and social programs for migrants, accelerating remediation of contaminated sites, and investing in biocultural restoration are critical to closing these gaps.

Recommendations

1. **Support for Climate Migrants** – Social services are needed as environmental degradation forces people in Pacific Island nations to leave their homelands. The State can provide guidance through a comprehensive plan to assess the physical and emotional needs of communities facing displacement and forced migration.

⁴³⁰ Felton, D., & van der Zander, I. (2021). *Risks of sea level rise and increased flooding on known chemical contamination in Hawaii*. Hawai‘i Department of Health. <https://climate.hawaii.gov/wp-content/uploads/2021/06/Climate-Change-and-Chemical-Contamination-memo-updated-June-2021.pdf>

2. **Accelerate Remediation of Coastal Contaminated Sites** - Prioritizing cleanup of hazardous facilities in flood-prone zones prevents pollutants from entering groundwater and fisheries. Early remediation is cheaper and safer than post-disaster cleanup. Mapping tools already developed by DOH HEER can guide investment.⁴³¹⁴³²
3. **Support Biocultural Restoration** - Reviving lo‘i kalo, loko i‘a, wetland and native-forest systems simultaneously improves food security, water quality, and cultural connection. These efforts restore ecological balance, sequester carbon, and provide healthy local foods, creating measurable public-health gains through improved nutrition and community cohesion.

Wildfires

Once considered rare in Hawai‘i, wildfires have become one of the islands’ most visible and destructive climate hazards. In the past century, the average burned area has increased fourfold, and more than a thousand fires now ignite across the state every year⁴³³. Prolonged drought, invasive grasses that burn readily, and stronger winds driven by climate change create conditions similar to the western U.S. The 2023 Lāhainā fire exposed how quickly a wind-whipped blaze can overrun neighborhoods, destroy homes, and endanger lives.

Smoke from wildfires contains carbon monoxide, nitrogen oxides, and fine particulate matter (PM_{2.5}) that penetrate deep into the lungs. Exposure worsens asthma, COPD, and heart disease and increases risk of premature birth and low birth weight.⁴³⁴ Kūpuna and children are particularly vulnerable because of reduced lung capacity or developing airways. Beyond physical illness, displacement and loss of homes inflict lasting psychological trauma and strain community cohesion.

Current Gaps

The DLNR Division of Forestry and Wildlife (DOFAW) and the Hawai‘i Wildfire Management Organization (HWMO) lead prevention and Firewise outreach, and post-fire air monitoring has improved. Still, wildfire management in Hawai‘i remains underfunded and highly uneven, especially for rural and neighbor-island communities. Many neighborhoods lack resources to implement Firewise recommendations or to maintain defensible space due to cost and land-use constraints. Post-fire mental health and housing recovery frameworks are reactive and often inadequate, with limited long-term counseling or rebuilding assistance for displaced residents.

⁴³¹ Felton, D., & van der Zander, I. (2021). *Risks of sea level rise and increased flooding on known chemical contamination in Hawaii*. Hawai‘i Department of Health. <https://climate.hawaii.gov/wp-content/uploads/2021/06/Climate-Change-and-Chemical-Contamination-memo-updated-June-2021.pdf>

⁴³³ Hawaii Wildfire Management Organization. (2018). *Wildfire in Hawaii factsheet*. <https://www.hawaiiwildfire.org/fire-resource-library-blog/wildfire-in-hawaii-factsheet>

⁴³⁴ Heft-Neal, S., Driscoll, A., Bendavid, E., & Burke, M. (2022). Associations between wildfire smoke exposure during pregnancy and risk of preterm birth in California. *Environmental Research*, 203, 111872. <https://doi.org/10.1016/j.envres.2021.111872>

Additionally, public awareness of wildfire smoke hazards remains low, particularly among kūpuna and those with preexisting respiratory conditions. These gaps highlight the need to expand community

Recommendations

1. **Expand Community Firewise Programs** - Linking communities that have completed Firewise planning with those just beginning the process to share lessons and best practices can quickly expand the program. Increases in funding for community-led wildfire risk reduction projects, such as clearing overgrown invasive grasses and improving defensible space around homes and community facilities is needed.
2. **Public Outreach on Smoke Exposure** - Increase public outreach on the health risks of wildfire smoke and harmful particulate matter (PM2.5), coordinated by HDOH and county partners with targeted education for kūpuna and other sensitive populations on how to reduce exposure and protect respiratory health.

Degraded Living Conditions & Social Inequities

Climate change acts as a “risk multiplier,” amplifying existing social and health disparities. Hawai‘i’s high cost of living already forces many families into overcrowded or substandard housing. Rising heat, flooding, and food and energy costs further strain those budgets. Nearly 44% of households fall below the ALICE (Asset Limited, Income Constrained, Employed) threshold.⁴³⁵ During disasters residents without vehicles or internet face the greatest barriers to evacuation and recovery. These inequities translate directly to poorer physical and mental health.

Current Gaps

Efforts like Honolulu’s Resilience Strategy and the Hawai‘i Public Health Institute’s listening sessions have begun to incorporate equity into climate planning, but statewide data on social determinants of health and climate exposure are still fragmented. Many affordable-housing programs do not require climate-resilient design such as passive cooling or mold prevention, leaving low-income residents more exposed to heat and flooding. Communities with limited access to transportation, digital alerts, or insurance remain disproportionately affected during disasters. While the CCMAC has elevated the importance of equity, systematic mechanisms for community input and culturally grounded adaptation remain underdeveloped.

Recommendations

1. **Integrate Climate Resilience into Affordable Housing** - All new affordable-housing projects should include passive-cooling design, mold-resistant materials, and safe ventilation systems. These upgrades lower energy costs and prevent respiratory illness

⁴³⁵ Aloha United Way. (2022). *ALICE in Hawai‘i: 2022 Facts and Figures*.
<https://www.auw.org/sites/default/files/pictures/ALICE%20in%20Hawaii%20-%202022%20Facts%20and%20Figures%20Full%20Report.pdf>

while protecting residents during heat or flooding events. Including such features from the start costs less than retrofitting later and supports long-term health equity.

2. **Vulnerability Assessment and Targeted Strategies** – Better understanding how climate change impacts vulnerable populations in Hawai‘i and customized adaptation and resilience strategies tailored to the needs of different populations, communities, and cultures are needed. Monitoring efforts should include regular community listening sessions and partnerships with trusted local organizations and cultural practitioners to ensure strategies are grounded in lived experience and community priorities.

Risk of Invasive Vectors

Changing rainfall and temperature patterns are expanding the habitats of mosquitoes and other disease vectors. Hawai‘i already hosts *Aedes albopictus* and *Aedes aegypti*, capable of transmitting dengue, Zika, and chikungunya viruses. While these diseases are not yet established, outbreaks in 2001 and 2015 demonstrate how quickly transmission can occur when infected travelers arrive.⁴³⁶ Warming conditions also favor ticks and fleas that can spread other zoonotic diseases. Island ecosystems, with limited predator species and year-round breeding temperatures, make vector control uniquely challenging.

Current Gaps

HDOH’s Vector Control Branch and the Hawai‘i Invasive Species Council conduct mosquito surveillance and education, and recent *Wolbachia* mosquito suppression pilots mark important progress for protecting native birds. However, vector surveillance focused on human health remains limited, with few resources for continuous mosquito mapping or future habitat modeling under climate scenarios. There is no consistent funding stream to sustain control programs. Public awareness of household mosquito-breeding sites is inconsistent, and cleanup campaigns are sporadic. These limitations leave communities vulnerable to dengue and other vector-borne diseases should they reemerge.

Recommendations

1. **Mosquito Management, Surveillance, and Funding** - Expand statewide vector management and surveillance to address mosquito-borne disease risks intensified by climate change. Provide dedicated funding to conduct statewide mosquito mapping and model future habitat risks based on changing temperature, precipitation, and elevation patterns, with attention to vulnerable communities.
2. **Community Education and Source Reduction** - Public campaigns encouraging residents to eliminate standing water in yards, gutters, and construction sites can drastically cut

⁴³⁶ Effler, P. V., Pang, L., Kitsutani, P., Vorndam, V., Nakata, M., Ayers, T., Elm, J., Tom, T., Reiter, P., Rigau-Pérez, J. G., Hayes, J., Mills, K., Napier, M., Clark, G. G., Gubler, D. J., & Hawaii Dengue Outbreak Investigation Team. (2005). Dengue fever, Hawaii, 2001–2002. *Emerging Infectious Diseases*, 11(5), 742–749. <https://doi.org/10.3201/eid1105.041063>

mosquito populations. When paired with neighborhood cleanup days and school-based education, these efforts foster community ownership of prevention.

Food System Impacts

Hawai‘i imports roughly 85–90 percent of its food, leaving residents highly vulnerable to global supply disruptions from climate-driven disasters.⁴³⁷ At the same time, local agriculture faces drought, flooding, invasive species, and rising input costs. In Hawai‘i, one in seven residents and one in five children experience food insecurity.⁴³⁸ As climate change causes food prices climb, families rely on cheaper processed foods, driving obesity, diabetes, and heart disease.⁴³⁹

Current Gaps

Programs like DA BUX and the Hawai‘i Good Food Alliance have improved access to local produce for low-income households, and emergency food distribution networks were strengthened after recent disasters. However, most state planning remains reactive, focused on short-term food aid rather than systemic resilience. Local farms face persistent challenges from drought, invasive species, and high input costs, limiting capacity to supply emergency or everyday food needs. There is insufficient investment in processing, storage, and cooperative distribution infrastructure that would stabilize local supply. Additionally, few programs integrate cultural or ‘āina-based food education into public health messaging, missing opportunities to link nutrition, identity, and climate resilience. The following recommendations aim to address these gaps by expanding local food initiatives, creating hyperlocal food-security plans, integrating preparedness into healthcare practice, and supporting traditional food revival.

Recommendations

1. **Develop Hyperlocal Food-Security Plans** - Neighborhood-scale strategies to address emergency food needs during disasters or supply-chain disruptions are needed
2. **Strengthen Local Food Initiatives** - Scale and sustain funding for local food security initiatives such as Hawai‘i Foodbank, Hawai‘i Good Food Alliance, and DA BUX, and increase investment in local farms to expand access to fresh foods while reducing dependence on imported supplies. Supporting cooperative processing and cold-storage facilities would help farmers maintain supply after storms or droughts.

⁴³⁷ Office of Planning & Department of Business, Economic Development & Tourism (DBEDT). (2012). *Increased food security and food self-sufficiency strategy*. https://files.hawaii.gov/dbedt/op/spb/INCREASED_FOOD_SECURITY_AND_FOOD_SELF_SUFFICIENCY_STRATEGY.pdf

⁴³⁸ Feeding America (2025). “Hunger in America > Hawaii”, Accessed 20 Sept 2025. www.feedingamerica.org/hunger-in-america/hawaii

⁴³⁹ Gregory, C. A., & Coleman-Jensen, A. (2017). *Food insecurity, chronic disease, and health among working-age adults (ERR-235)*. U.S. Department of Agriculture, Economic Research Service. <https://www.ers.usda.gov/webdocs/publications/84467/err-235.pdf>

3. **Integrate Preparedness into Healthcare Practice** - Provide training for healthcare providers to discuss assess whether patients have basic supplies, including food supply, water, and medications and support networks in place for emergencies.
4. **Community Education and Cultural Food Revival** - Support public-health campaigns that promote traditional Hawaiian foods such as kalo, ‘ulu, and limu, connecting cultural identity to nutrition, sustainability, and climate resilience. Invest in community programs that revive traditional growing and fishing practices, diversify local diets, and reduce reliance on imported foods vulnerable to climate shocks.

Severe Weather & Floods

Hawai‘i is experiencing more intense rainfall events and tropical cyclones as ocean temperatures rise. Severe weather leads directly to injury, drowning, and death, and indirectly to illness when flooding disrupts utilities, contaminates drinking water, or damages healthcare infrastructure. Floodwaters increase risk to leptospirosis, skin infections, and exposure to chemicals or sewage from damaged cesspools.⁴⁴⁰ Many coastal and rural communities are accessible by a single roadway. When weather blocks these routes, access to hospitals, medication, and food is limited.

Current Gaps

County hazard-mitigation plans and the National Weather Service provide alerts, and Honolulu’s Storm Water Utility supports green infrastructure. However, public health agencies are not consistently integrated into county hazard mitigation or emergency management planning processes, leading to limited coordination across sectors. As a result, many healthcare and social-service agencies are not fully incorporated into disaster response, contributing to delays in shelter openings or transportation for medically fragile residents. Older homes and critical facilities lack retrofits for flooding and mold prevention, and public education on post-flood health risks is minimal. There is also no standardized mechanism to align flood alerts with shelter operations or multilingual outreach for non-English-speaking populations.

Recommendations

1. **Early-Warning and Shelter Coordination** - Aligning flood alerts with shelter openings and transportation support allows faster evacuation of medically fragile residents. Multilingual text alerts and radio messages help reach immigrant and rural populations who may miss English-only notices. These can be based upon FEMA’s Integrated Public Alert and Warning System (IPAWS) guidance and CDC’s BRACE framework for improving communication and evacuation planning for vulnerable populations.
2. **Mold and Indoor-Air Remediation Support** - Following heavy rain, mold can develop within 24 hours in Hawai‘i’s humid climate. Providing mold-remediation kits, N95 masks, and training for residents prevents respiratory illnesses that spike after floods.

⁴⁴⁰ Centers for Disease Control and Prevention (CDC). (2020). *Flood Waters or Standing Waters*. <https://www.cdc.gov/healthywater/emergency/extreme-weather/floods-standingwater.html>

3. **Community-Based Preparedness Drills** - Partnering with schools, faith organizations, and resilience hubs for annual disaster-readiness drills increases community self-reliance. Simulating power outages, evacuation, and medical triage strengthens coordination between agencies and residents.

Water Quality Impacts

Climate-driven changes in rainfall and temperature threaten Hawai‘i’s freshwater aquifers and coastal water quality. Heavy rains and flooding can overwhelm cesspools, releasing pathogens and nutrients into groundwater and nearshore waters. Drought and sea-level rise, meanwhile, increase salinity and concentrate pollutants in limited supplies. Warmer surface waters foster harmful algal blooms and pathogens such as *Vibrio vulnificus*⁴⁴¹. These exposures cause gastrointestinal, skin, and neurological illnesses and endanger subsistence fishers reliant on nearshore harvests.

Current Gaps

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⁴⁴¹ McCallen, J. (2024). Climate Change & Health in Hawai‘i: Comprehensive Vulnerability Assessment. [Living document]. Hawai‘i State Department of Health, Climate Change and Health Program. Storydoc. <https://www.storydoc.com/9024b4f3c6dc04a5870b66b700a6fc19/c8741689-04ae-4347-97f7-a1261797b198/65c6dea641e4a2000b44585d> (Accessed September 3, 2025)

blooms and pathogens such as *Vibrio vulnificus*.⁴⁴² These exposures cause gastrointestinal, skin, and neurological illnesses and endanger subsistence fishers reliant on nearshore harvests.

Current Gaps

There is no centralized platform for real-time water-quality information accessible to the public. HDOH's Clean Water Branch and the Cesspool Conversion Working Group monitor and guide efforts to reduce contamination, but implementation and funding gaps persist. The state's goal to eliminate cesspools by 2050 lacks sufficient financial and technical support for low-income households. Enforcement and permitting processes remain slow, and nutrient runoff from agriculture continues to affect coastal waters. Community water-quality monitoring programs such as Hui O Ka Wai Ola and the Surfrider Foundation, can help fill data gaps but operate on limited funding and geographic scope.

Recommendations

1. **Accelerate Cesspool Conversion and Innovate Solutions** – Building on Act 198 (2025) expand options low-cost options beyond conventional systems and invest in community-scale treatment systems and systems that actively remove nitrogen and pathogens. Establish a dedicated fund and streamlined permitting to scale systems equitably.
2. **Scale Community Water-Quality Monitoring** - Expand community participatory water quality monitoring programs across the state to enable rapid detection of contamination, empower residents with local data, and build employable skills in community workforce.
3. **Strengthen Public Communication and Transparency** - A centralized online dashboard summarizing real-time water-quality and brown-water advisories would improve trust and allow tourists and residents to make safer recreation choices.

Healthcare Facility Readiness

Extreme heat, hurricanes, flooding, and wildfire smoke increasingly disrupt healthcare operations. Many facilities lack redundant power, backup water, or secure supply chains. Rural clinics and hospitals on neighbor islands are especially isolated when ports or airports close. Climate-related surges in asthma, heat illness, and trauma overwhelm staff already facing workforce shortages. Without preparedness training, providers may not recognize environmental causes of patient symptoms, such as waterborne infections after floods or heat exposure during.

Current Gaps

Hawai'i's hospitals coordinate emergency planning through the Healthcare Association and FEMA/HI-EMA partnerships, and a few facilities have installed solar and battery backup systems.

⁴⁴² McCallen, J. (2024). Climate Change & Health in Hawai'i: Comprehensive Vulnerability Assessment. [Living document]. Hawai'i State Department of Health, Climate Change and Health Program. Storydoc. <https://www.storydoc.com/9024b4f3c6dc04a5870b66b700a6fc19/c8741689-04ae-4347-97f7-a1261797b198/65c6dea641e4a2000b44585d> (Accessed September 3, 2025)

The Hawai'i Healthcare Emergency Management (HHEM) coalition provides training and exercises to strengthen coordination and preparedness across hospitals and clinics, but participation varies by facility and is not mandatory. As a result, preparedness remains inconsistent across healthcare providers, particularly in rural and neighbor-island settings where access to supplies and staff is limited during disasters. While healthcare facilities are federally required to maintain emergency operations plans, Hawai'i has no statewide standards mandating redundant power, water, or climate-resilient infrastructure, leading to uneven preparedness across facilities. The John A. Burns School of Medicine (JABSOM) includes elective courses on climate and health, and UH Health Sciences Institute is seeking federal funds to establish a Climate Health Center of Excellence, however climate change is only partially integrated into health curricula. These gaps highlight the need for training on environmental history-taking, expanded climate-health education across medical and allied professions, and stronger workforce preparedness for operations during climate emergencies.

Recommendations

1. **Integrate Climate and Environmental History into Patient Care** - Train healthcare providers to routinely collect an environmental history during patient intake to better identify links between illness and local climate or environmental exposures. Standardized questions such as where symptoms began or which areas patients visited can help track patterns in heat illness, waterborne disease, and other climate-related health impacts.
2. **Expand Climate and Health Education Across Professions** - Expand climate change and health education in medical, nursing, and allied health programs by integrating testable learning objectives, required coursework, and experiential learning opportunities. Build on the University of Hawai'i's JABSOM model which uses problem-based learning (PBL) to connect patient care to environmental conditions and develop new climate and health electives guided by national resources such as the *Medical Students for a Sustainable Future (MS4SF) Climate and Health Curriculum Reform Guide*. Establish Climate and Health fellowships modeled after Yale or George Mason's climate-health programs to prepare future healthcare professionals to address Hawai'i's climate-related health challenges.
3. **Increase Funding and Staffing Support for Community Health Centers.** - Community based clinics should be equipped and staffed to provide heat and smoke response care, mental health services, and chronic disease management during and after extreme weather events, particularly in disadvantaged and rural communities.

Mental Health & Wellbeing

Climate change threatens mental wellbeing through both acute trauma and chronic ecological stress. Events like the Lahaina wildfire cause post-traumatic stress disorder (PTSD), depression, and grief, while gradual changes such as rising seas, heat, and biodiversity loss generate "eco-anxiety" and solastalgia, a deep sadness linked to environmental decline. Youth report growing fear and hopelessness about their future, and statewide, more than a quarter of adults report climate

related anxiety or depression symptoms.⁴⁴³ After recent disasters, many Hawai‘i residents experienced severe emotional distress and trauma, yet lacked timely access to coordinated mental health support. The absence of a clear post-disaster care framework contributed to preventable crises, including suicides and long-term psychological harm.

Disasters disrupt not only daily life but also people’s sense of place and belonging, which are pillars of wellbeing in Hawaiian culture. Native Hawaiian and Pacific Islander communities, whose identities are tied to land and ocean, experience particular distress when connection to place and natural environments is lost. For many, reconnecting with place and community is a powerful source of healing and resilience. Evidence shows that time in nature reduces cortisol levels and strengthens emotional resilience, and culturally grounded, ‘āina-based approaches amplify these benefits by restoring connection to land, identity, and community.⁴⁴⁴ Strengthening these connections through ‘āina-based programs and youth initiatives can help individuals, especially youth, cope with and restore hope after climate-related events.

Current Gaps

After the Maui wildfires, temporary counseling and outreach were provided by HDOH and community partners, and the Office of Wellness and Resilience (OWR) has begun coordinating trauma-informed initiatives. Yet Hawai‘i still lacks a systematic framework for post-disaster mental health support, resulting in uneven access to care and preventable crises following major events. Youth-focused and ‘āina-based prevention programs are limited in scale, and there is little ongoing data collection on climate-related anxiety, grief, or eco-distress. Most mental health services are clinic-based rather than community-embedded, leaving rural and island populations underserved. Building capacity for eco-grief training, youth resilience, and culturally grounded healing networks is essential to fill these gaps and strengthen the state’s long-term mental wellbeing infrastructure.

Recommendations

- 1. Statewide Assessment of Climate-Related Mental Health Needs**
Conduct a statewide assessment to measure stress, anxiety, and grief associated with environmental change, providing a baseline to guide investment in mental health services and community supports. Ongoing tracking of these indicators would help evaluate adaptation success and wellbeing outcomes beyond physical health measures.
- 2. Training Therapists in Eco-Grief and Climate Anxiety** - Support for the development of continuing-education modules and certifications in eco-grief and climate anxiety for mental health professionals is needed. By facilitating coordination between DOH, the OWR, universities, and professional associations, the State could help equip therapists to

⁴⁴³ Kaiser Family Foundation (KFF). (2023). *Mental Health and Substance Use State Fact Sheets: Hawai‘i*. <https://www.kff.org/statedata/mental-health-and-substance-use-state-fact-sheets/hawaii>

⁴⁴⁴ Park, B. J., Tsunetsugu, Y., Kasetani, T., Kagawa, T., & Miyazaki, Y. (2010). *The physiological effects of Shinrin-yoku (taking in the forest atmosphere or forest bathing): Evidence from field experiments in 24 forests across Japan*. *Environmental Health and Preventive Medicine*, 15(1), 18–26. <https://doi.org/10.1007/s12199-009-0086-9>

recognize and treat distress linked to climate events. Building this capacity could position Hawai‘i as a national leader in addressing the psychological impacts of climate change.

3. **Hope-Based Public Campaigns** - Transparent communication about state climate goals and visible progress builds public confidence and counters hopelessness. Highlighting community success stories such as reef restoration or renewable-energy milestones helps reframe climate action as empowerment rather than loss.
4. **Culturally Grounded and Youth-Based Resilience Networks** - Culturally grounded and youth-based mental health resilience programs that connect healing to place, culture, and community funding and coordination through HDOH, DOE, and OWR, and in partnership with community organizations and cultural practitioners is needed. Activate mental health support networks during and after disasters to provide emotional comfort and continuity of care for affected residents. Integrate ‘āina-based practices into state-supported mental health and recovery programs to strengthen identity, belonging, and recovery. Partner with schools and youth organizations to build coping skills, mindfulness, and environmental stewardship, giving younger generations tools to manage climate anxiety through connection to place and community action.
5. **Post-Disaster Mental Health and Healing**- Develop and maintain post-disaster mental health frameworks that provide immediate and culturally grounded counseling, crisis intervention, and community healing for those affected by climate-related disasters. Evaluate and strengthen current frameworks for mental health support following disasters to address gaps that have led to preventable crises such as suicides. Embedding counselors and cultural healers within emergency-response teams can help survivors process trauma, reduce long-term depression and anxiety, and avoid such crises. Coordination between DOH, emergency management agencies, and local service providers should ensure rapid deployment of trained professionals and integration with resilience hubs and shelter operations to strengthen recovery and community trust.

Cross-Cutting Recommendations

While many health impacts of climate change are addressed through specific sectoral interventions, several priorities cut across all issue areas. These cross-cutting recommendations reflect the foundational strategies needed to strengthen Hawai‘i’s overall climate-health preparedness, coordination, and equity. Implementing these measures will improve the State’s ability to protect residents, especially those most vulnerable, from multiple and overlapping climate-related health risks.

1. Community Listening Sessions

Sustained and meaningful community engagement is fundamental to effective climate and health adaptation. Regularly held community listening sessions in vulnerable neighborhoods can ensure that state and county agencies understand community-specific needs, priorities, and lived experiences. These sessions should include kūpuna, youth, individuals with disabilities, houseless individuals, and other underrepresented voices.

Such sessions serve not only to inform government planning but also to build trust and increase public awareness of available services before disaster events. When properly facilitated, they can

identify gaps in evacuation planning, emergency communications, health access, and social services that are not visible through data alone.

Embedding listening sessions into DOH’s Climate Change and Health Program, in partnership with local resilience offices, can institutionalize this process as part of all major adaptation initiatives.

2. Support Services for Elderly and Zero-Vehicle Households

Extreme weather, flooding, and wildfire smoke events disproportionately affect kūpuna and households without vehicles, who may struggle to access shelters, medical facilities, or cooling centers. Targeted support programs such as pre-event registries of residents requiring transportation assistance, outreach through community health workers, and collaboration with paratransit and volunteer driver networks can prevent loss of life and ensure equitable access to emergency services. Integrating these needs into disaster preparedness plans and utilizing existing community-based care networks will help identify and support at-risk residents.

3. Community Resilience Hubs

Community resilience hubs are a proven, multi-benefit model for addressing numerous public health and equity needs simultaneously. During disasters, hubs act both as communication conduits and coordinated response nodes. In normal periods, they foster preparedness, social cohesion, resource access, and cultural connection. These hubs can be equipped to provide:

- Cooling, clean-air, and charging centers during heat waves or wildfire smoke events
- Backup power for medical equipment and refrigeration of medications
- Food distribution and storage during supply disruptions
- Education and outreach on emergency preparedness, energy savings, and health protection
- Youth programs, kūpuna support services, and mental health resources

Hubs should be hosted in trusted local places such as community centers, schools, nonprofit spaces, or pop-up sites and powered by resident leaders trained through a statewide Hub Training Center. Resilience scorecards and participatory vulnerability mapping can be used to guide resource allocation and adaptive hub design.

4. Publicly Accessible Climate and Health Tracking System

A statewide public tracking system for health impacts of climate change would enable agencies, researchers, and the public to monitor evolving risks in real time. This system could include:

- An interactive web dashboard with climate-health indicators (heat-related illness, asthma ER visits, vector-borne diseases, etc.)
- Real-time alerts for extreme heat, poor air quality, and disease outbreaks
- Links to educational materials and local response guidance

The Department of Health could lead this initiative in collaboration with the University of Hawai‘i, leveraging CDC’s Building Resilience Against Climate Effects (BRACE) framework. A transparent data system would foster accountability, empower local decision-making, and improve coordination between health, emergency management, and environmental agencies.

5. Strengthening DOH Climate and Health Capacity

To ensure sustained leadership and expertise, the Climate Change and Health Coordinator position needs to be funded expanded Environmental Epidemiology capacity is needed. Currently, DOH maintains only one Environmental Epidemiologist dedicated to climate-health surveillance. Adding staff positions focused on environmental health tracking, vulnerability assessment, and program coordination would enable HDOH to more fully implement the CDC BRACE Framework, linking climate projections to health data, evaluating adaptation measures, and improving rapid response to emerging threats such as wildfire smoke, extreme heat, and vector-borne disease.

6. University of Hawai‘i Climate Health Center of Excellence

The University of Hawai‘i Health Sciences Institute is seeking to establish a Climate Health Center of Excellence. This initiative would serve as a hub for research, education, workforce development, and policy collaboration on climate and health. Such a center would strengthen statewide capacity for cross-sector collaboration, workforce training, and applied research, positioning Hawai‘i as a Pacific leader in climate-health innovation.

16.2 Key Partners

Addressing the health impacts of climate change in Hawai‘i requires collaboration across agencies, sectors, and communities. The following partners play central roles in both current and future work:

State Agencies:

Hawai‘i Department of Health (DOH): The DOH oversees surveillance, outbreak response, and environmental health programs that intersect with climate adaptation such as the Clean Water Branch, Vector Control Branch, and Hazard Evaluation and Emergency Response (HEER) Office.

The Hawai‘i Emergency Management Agency (HIEMA) plans for and responds to both natural and human-caused emergencies, including tsunamis, wildfires, hurricanes, hazardous materials incidents, and other threats. HIEMA is the coordinating agency on emergencies of all kinds between federal and local agencies, including the four county emergency management agencies and the Federal Emergency Management Agency (FEMA).

Department of Land and Natural Resources (DLNR): DLNR manages forest restoration, watershed protection, drought response, and wildfire prevention efforts that serve as frontline climate-health interventions.

University of Hawai‘i System: Through the John A. Burns School of Medicine(JABSOM), UH Health Sciences Institute, and Sea Grant College Program, UH advances research on climate-health links, develops curriculum, and trains the future climate-ready workforce.

Office of Wellness and Resilience (OWR): Housed within the Office of the Governor, OWR leads efforts to build trauma-informed, resilience-focused systems across Hawai‘i. The office coordinates programs addressing behavioral health, climate-related stress, and disaster recovery, emphasizing culturally grounded healing and community collaboration. OWR’s partnership with HDOH, DOE, and community organizations is central to advancing mental-health resilience, youth programs, and post-disaster wellness initiatives.

County Agencies:

County Offices of Climate Change and Resiliency: Each county office implements local adaptation plans, resilience hubs, and disaster preparedness programs that directly protect public health.

Hawai‘i County Civil Defense Agency includes responsibilities for natural disasters and emergencies, coordinating emergency response, public safety, information dissemination, mutual aid, shelter provision, and overall emergency preparedness.

Maui Emergency Management Agency (MEMA) mission is to ensure the safety and resilience of Maui Nui through coordinated planning, hazard preparedness, and emergency response.

Kauai Emergency Management Agency’s mission statement is to protect lives and property in the County of Kaua‘i by coordinating and integrating efforts among all levels of government and the private sector to mitigate against, prepare for, respond to and recover from natural disasters, acts of terrorism and other threats and hazards.

The City and County of Honolulu’s Department of Emergency Management (DEM) coordinates preparedness and response plans, programs, and initiatives with city, state, federal, private, corporate, and non-government entities. DEM was established in 2007 by Chapter 127A-5⁴⁴⁵ of the Hawai‘i Revised Statutes, and Section 6-103, page 34 of the Revised Charter of the City and County of Honolulu. Prior to 2007, the department was known as the O‘ahu Civil Defense Agency.

⁴⁴⁵ Chapter 127A, “Emergency Management.” 2024 Hawai‘i Revised Statutes.

Public Private Partnerships:

Hawai'i Climate Change and Health Working Group (CCHWG): A cross-sector collaboration of public health professionals, environmental scientists, community advocates, and agency representatives that identifies emerging threats, develops adaptation strategies, and supports equitable health outcomes statewide. The CCHWG provides critical expertise on local vulnerabilities, health data integration, and culturally appropriate engagement.

Hawai'i Public Health Institute (HIPHI): HIPHI coordinates community-based programs, policy advocacy, and educational campaigns linking public health to climate resilience. Its *Healthy Hawai'i Strategic Plan* and *Climate for Health* initiatives have strengthened the connection between healthcare, environment, and equity.

Hawai'i Healthcare Emergency Management (HHEM): HHEM, a program of the Healthcare Association of Hawai'i, coordinates emergency preparedness, response, and recovery activities across the state's hospitals, long-term-care facilities, and community clinics. It provides training, exercises, and technical assistance to strengthen healthcare system resilience during natural disasters and public-health emergencies.

Community-Based and Native Hawaiian Organizations: Partnerships with community-based and Native Hawaiian organizations that center local knowledge, stewardship, and equity are essential for effective climate adaptation. Their involvement ensures policies align with cultural values of mālama 'āina and aloha 'āina.

16.3 Health Benefits of Climate Action Measures

Measures that reduce GHG often result in improvements in local air quality that impact human health and the environment. According to the latest Integrated Science Assessment from US EPA, particulate matter⁴⁴⁶ is associated with premature death and other serious health effects such as nonfatal heart attacks, irregular heartbeat, aggravated asthma, decreased lung function. Nitrous oxide (NOx) exposure is linked several adverse human health effects, most notably on the respiratory system.⁴⁴⁷ Emissions of NOx also contribute to the formation of PM2.5 and ground-level ozone. Ground level ozone⁴⁴⁸ causes effects in human health, such as respiratory and cardiovascular diseases. It has also effects on vegetation, ecosystems and climate. Lastly, sulfur dioxide (SO₂) is linked with a number of adverse effects on the respiratory system, particularly for exercising asthmatic individuals.

Current asthma rates in Hawai'i are alarmingly high, affecting 9.2% of our children. By implementing the distributed solar PV measure alone, we prevent over 9,500 metric tons of nitrous oxides and 15,700 metric tons of sulfur oxides from entering our atmosphere by 2050. Nitrous oxides is a primary trigger for asthma attacks. Removing this volume of pollution is equivalent to

⁴⁴⁶ <https://www.epa.gov/isa/integrated-science-assessment-isa-particulate-matter>

⁴⁴⁷ <https://www.epa.gov/isa/integrated-science-assessment-isa-oxides-nitrogen-health-criteria>

⁴⁴⁸ <https://www.epa.gov/isa/integrated-science-assessment-isa-ozone-and-related-photochemical-oxidants>

taking tens of thousands of gas-combusting cars off our roads, directly reducing the frequency of emergency room visits for respiratory distress.⁴⁴⁹

Fine particulate matter (PM2.5) is small enough to enter the bloodstream, causing heart attacks and premature death. The CAP measures prevent the emission of nearly 1,000 metric tons of PM2.5. According to EPA health benefit models, reducing PM2.5 yields the highest health return of any pollutant, potentially saving the state millions in avoided hospitalizations and lost workdays. This means fewer people suffering from preventable heart conditions and more active years for our seniors.

For selected measures emission reductions of co-pollutants were calculated. The table below shows cumulative emission reductions between 2026 and 2045 in co-pollutants for each calculated measure. These are sulfur dioxide (SO₂), nitrous oxide (NO_x), fine particulate matter (PM_{2.5}), carbon monoxide (CO) and ozone.

Cumulative (2026-2045) Emission Reductions (MT)	SO ₂	NO _x	PM _{2.5}	CO	Ozone
Distributed Solar PV	-15,764	-9,554	-955		
Reduce energy consumption in buildings	4,863	-2,947	-295		
New building codes	-1,280	-776	-78		
Rental vehicles electrification		-3,886	-173	-153,580	
Fuel decarbonization		-14,865	-2,117		
Mode shift		-42,989	-1,087	-43,032	
Fuel decarbonization		-84,282		-43,186	
Electrification		-2,809		-194,644	
Fuel decarbonization		-15,325,020			
Energy efficiency in cruise ships		-3,493,215			
Agricultural soil amendment					
Nature based solutions: forests	-10,831	-737	-1,926	-727	-12,776
Renewable Energy	-9,644	-122,392	-9,782		

Table 76: Cumulative (2026-2045) co-pollutant emissions reductions from implementation of CAP measures.

Conclusion

The evidence is clear: climate change is already affecting the health and wellbeing of Hawai‘i’s people. Rising temperatures, shifting rainfall patterns, intensifying storms, wildfires, and sea-level rise all intersect to shape the islands’ environmental and social conditions. The resulting health impacts are interconnected, cumulative, and unequally distributed. Addressing climate and health

⁴⁴⁹ Hawai‘i Department of Health. ‘Asthma Rates in Hawai‘i’ <https://health.hawaii.gov/asthma/hawaii-asthma-control-program-2/what-is-asthma/>

in Hawai‘i requires strengthening the foundations of community resilience: clean air and water, stable housing, nutritious food, mental wellbeing, and a deep cultural connection to ‘āina.

The strategies outlined in this chapter provide a framework for coordinated, equitable, and culturally grounded action. Many initiatives are already underway across state agencies, the University of Hawai‘i system, and community organizations, but achieving meaningful impact will require sustained funding, interagency coordination, and integration of health considerations across all sectors.

Finally, adaptation efforts should be guided by community voice and local leadership. Holding regular listening sessions in vulnerable areas, supporting resilience hubs, and investing in youth and ‘āina-based programs ensure solutions reflect lived experience and build public trust. Through collaboration, Hawai‘i can become a model for integrated climate-health action that honors ‘āina, uplifts equity, and safeguards the wellbeing of future generations.



17. Building Resilience to Climate Hazards

Introduction

The resilience of Hawai‘i's communities and ecosystems is directly threatened by an array of accelerating climate impacts, a reality clearly reflected in the top public concerns gathered through statewide outreach. This chapter addresses the urgent need to mitigate the risks posed by flooding, sea level rise, rising heat, drought, and wildfire, while also confronting interconnected issues such as invasive species, water quality, protection of natural and cultural resources, and waste management. By strengthening critical infrastructure, improving transportation resilience, supporting community preparedness, and addressing vulnerabilities in energy systems, Hawai‘i can build a foundational capacity for all residents to thrive amidst a changing climate.

Hawai‘i is both extraordinarily resilient and uniquely exposed. The islands sit within a dynamic Pacific climate system where trade winds, kona lows, steep watersheds, and diverse microclimates shape everyday weather, which is becoming increasingly extreme in the face of climate change. A single storm or wildfire can trigger cascading failures in transportation, water systems, communication networks, and access to health and social services. Recent events including the record-setting April 2018 Kaua‘i flood, the extreme rainfall associated with Hurricane Lane, and the 2023 Maui wildfires revealed how quickly hazards can cascade across systems and communities. Drought and invasive grasses heighten fire risk; post-fire rains bring flash flooding and sediment that damage streams and reefs and sea-level rise worsens coastal erosion and drainage failures. Multiple assessments conclude that climate change is increasing the intensity and frequency of these hazards, and that the impacts are inequitable, falling hardest on communities with fewer resources to prepare and recover.⁴⁵⁰

These hazards increasingly occur together or interact, overwhelming systems designed for yesterday’s climate and widening inequities when those least able to retrofit or relocate face the greatest exposure.⁴⁵¹ Recent climate readiness assessments show that hazards rarely occur in isolation.⁴⁵² Extended drought can lead to wildfire which erodes natural water catchment systems and leaves exposed soil and residual toxic matter from homes and infrastructure. Heavy Rain can exacerbate this, leading to fast moving mudslides that can cause significant damage to communities and infrastructure. The combination of fire and rain can create debris flows, where water mixes with ash, rocks, and sediment to form a slurry that rushes downhill. This can carry large items such as boulders, trees, and cars, creating a torrent of sediment and debris. These interconnected disruptions can isolate communities, delay medical care, interrupt schooling, and undermine recovery efforts, especially in areas with limited redundancy or only one evacuation route. Effective resilience planning must address these cross-system interactions, not hazards in isolation.

This chapter builds on County adaptation plans, State and County Hazard Mitigation Plans, and the Hawai‘i Climate Action Team’s Policy Papers and aims to describe what is changing, why it matters, and State and County actions that can reduce losses, protect health, and speed recovery, ultimately saving lives, minimizing financial costs, and safeguarding cultural sites and natural resources in the process.

⁴⁵⁰ Frazier, A.G., M.-V.V. Johnson, L. Berio Fortini, C.P. Giardina, Z.N. Grecni, H.H. Kane, V.W. Keener, R. King, R.A. MacKenzie, M. Nobrega-Olivera, K.L.L. Oleson, C.K. Shuler, A.K. Singeo, C.D. Storlazzi, R.J. Wallsgrove, and P.A. Woodworth-Jefcoats. (2023). Ch. 30. Hawai‘i and US-Affiliated Pacific Islands. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH30>

⁴⁵¹ Habel, S., Fletcher, C. H., Anderson, T. R., & Thompson, P. R. (2020). *Sea-Level Rise Induced Multi-Mechanism Flooding and Contribution to Urban Infrastructure Failure*. Scientific Reports, 10(1). Link; ‘ Emergency Management Agency, *State of Hawai‘i 2023 Hazard Mitigation Plan*. Accessed from 2023 Hawaii State Hazard Mitigation Plan

⁴⁵² Ko‘olau Poko Community Resilience Center. *Ko‘olau Poko Readiness Review: Full Report*. 2025. Available at: https://imina.soest.hawaii.edu/crc/pdf/Koolau_Poko_Readiness_Review_Full%20Report.pdf. Accessed December 4, 2025.

Climate Change Impacts

Climate change is reshaping the patterns and intensity of weather and natural hazards across the islands. The sections below summarize the major impacts and hazards affecting Hawai‘i today and that are projected to worsen in the future. This hazard landscape provides the foundation for the recommended actions that follow.

Economic Impacts

The state faces ongoing expected annual property loss of roughly US\$1.4 billion due to hurricanes, wildfire, flood, and earthquakes, according to an analysis conducted by the Hawai‘i Climate Advisory Team (CAT).⁴⁵³ There are tangible financial returns from climate resilience investments: wind hardening can prevent expensive roof losses and rain damage; watershed protection and green streets can reduce flood damages; and reef and dune restoration can avoid millions of dollars in shoreline losses from a single storm.⁴⁵⁴ Benefits compound when investments are layered: resilience hubs reduce sheltering and health costs during outages and help small businesses rebound; invasive plant removal reduces fire management and insurance costs while protecting watersheds; and training programs paired with upgraded resilience translate into local jobs and in-state spending. Beyond dollars, early action protects cultural resources, subsistence practices, and community cohesion, which are values central to Hawai‘i’s future wellbeing.⁴⁵⁵

Insurance Challenges

Hawai‘i is already experiencing a climate-driven insurance crisis. Climate change hazards are placing an increasing strain not only on homeowners, but on insurers as well.⁴⁵⁶ Property owners are experiencing steep premium increases, rising deductibles, and in some cases nonrenewals or difficulty securing coverage at all, particularly in areas exposed to wildfire, flood, or sea-level rise.⁴⁵⁷ These trends mirror national patterns, but Hawai‘i’s geographic isolation and concentrated coastal development make the state particularly vulnerable to market volatility. Without coordinated action, insurance may become increasingly unaffordable or unavailable in high-risk

⁴⁵³ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. Accessed from

https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

⁴⁵⁴ Environmental Protection Agency. (2018, June). *Greening America’s Communities*. Accessed from EPA Greening Iwilei and Kapalama; University of Hawai‘i Sea Grant. (2020) “Facing the Storm”. *Ka Pili Kai*, 43; Sims, Jennifer & Hoke, Ashley. (2024). Mapping the Risk Reduction Benefits of Coral Reef Conservation – Hawai‘i Case Study. *Nature-Based Solutions*. 5. 100128. 10.1016/j.nbsj.2024.100128.

⁴⁵⁵ 2025 Local Hazard Mitigation Plan, City & County of Honolulu, p.iii. Accessed from

<https://www.honolulu.gov/dem/wp-content/uploads/sites/64/2025/06/Executive-Summary.pdf>

⁴⁵⁶ Hawai‘i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. Accessed from

https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

⁴⁵⁷ Abrahams, D., & Robustelli, T. (2025). *Insurance in Hawai‘i: Lessons for California*. New America.

<https://www.newamerica.org/future-land-housing/briefs/insurance-in-hawaii-lessons-for-california/>

areas, exacerbating inequities and slowing disaster recovery. As these pressures grow, many residents experience long delays in claims processing and increasing rates of underinsurance. Yet the State has no consistent method to track length of claim processing, whether some communities face higher denial rates, or if payouts routinely fall short of actual losses.

A major concern during climate-related disasters is that low-income households and small businesses struggle to recover financially, even when they have some insurance coverage. Gaps in coverage, high deductibles, or delays in payouts can leave residents without the resources they need in the critical weeks after a wildfire, hurricane, or flood.

Flood risk is an important piece of the insurance landscape, because standard homeowners' insurance does not cover flood damage. The Federal Emergency Management Agency's (FEMA) National Flood Insurance Program (NFIP) offers discounted flood insurance premiums for communities that actively reduce flood risk through FEMA's Community Rating System (CRS). Counties that strengthen stormwater management, improve floodplain regulations, provide clearer public information, or enhance emergency warning systems can earn better CRS scores, resulting in automatic discounts for every NFIP policyholder. Hawai'i's current CRS discounts provide modest savings: Hawai'i County and Maui County receive 15% off (Class 7), while Honolulu and Kaua'i counties receive 10% off (Class 8).⁴⁵⁸ With additional flood-risk reduction work, counties could qualify for deeper NFIP discounts that directly reduce costs for households and businesses.

Cultural Impacts

Hawai'i is deeply imbued with a sense of place, culture, and belonging, and its cultural identity is inseparable from its landscapes. As climatic hazards intensify, sites of cultural, historical, and ancestral importance are increasingly at risk. For Native Hawaiians, natural resources hold ancestral, spiritual, and genealogical meaning. The ahupua'a system managed land from mauka to makai in ways that sustained both ecosystems and cultural lifeways. Today, cultural practices including lā'au lapa'au, carving, weaving, hula, lo'i kalo cultivation, and nearshore fishing remain dependent on healthy forests, streams, and reef ecosystems that are threatened by climate change. Sea-level rise is eroding coastlines that provide resources for food, medicine, and other essential needs. Across the islands, flooding and erosion have exposed 'iwi kūpuna, creating hardship for those who hold responsibility for protecting ancestral remains. Skulls and skeletal remains were recently uncovered at Pōka'i Bay (2025),⁴⁵⁹ on Maui's North Shore (2024),⁴⁶⁰ and ancestral remains re-emerged at Kā'anapali Beach after a large swell in 2022.⁴⁶¹ Inland, flooding threatens historic buildings, heiau, wetlands, and lo'i systems. Extreme storms can damage centuries-old structures and drought weakens freshwater sources and traditional agricultural systems. Protecting

⁴⁵⁸ April 2025 CRS Eligible Communities. Federal Emergency Management Agency. Accessed Dec. 1 2025. https://www.fema.gov/sites/default/files/documents/fema_crs_eligible-communities_apr-2025.pdf

⁴⁵⁹ Hawai'i News Now. "Skull believed to be iwi kūpuna discovered in sand dunes at Pōka'i Bay; erosion and king tides increasingly exposing burial sites." August 29, 2025. <https://www.hawaiiinewsnow.com>. Accessed October 20, 2025.

⁴⁶⁰ North Shore Maui iwi kūpuna exposed by swell (2024)

Hawai'i News Now. "Siblings stumble across iwi kūpuna after monster surf slams Maui's North Shore." December 24, 2024. <https://www.hawaiiinewsnow.com>. Accessed October 20, 2025.

⁴⁶¹ Hawai'i News Now. "Iwi kūpuna discovered at Kā'anapali sparks debate over erosion plans and coastal protections." August 12, 2022. <https://www.hawaiiinewsnow.com>. Accessed October 20, 2025.

cultural resources requires elevating Native Hawaiian voices and ensuring that cultural considerations are embedded in adaptation planning at all levels.

Storm Frequency and Intensity

A warming ocean-atmosphere system increases the “fuel” available to tropical cyclones. The share of intense storms (Category 3–5) has increased in recent decades and is projected to rise further with additional warming, accompanied by higher rainfall rates, as a warmer atmosphere holds more moisture. Climatologists warn that, without deep global emissions cuts, the frequency of tropical systems affecting Hawai‘i could increase as storm tracks shift.⁴⁶² This means greater exposure to extreme rainfall, wind, and wave surge on communities and infrastructure. HI-EMA’s 2020–2025 Strategic Plan plainly states that Hawai‘i is likely unprepared for a plausible worst-case hurricane scenario, highlighting the need for accelerated mitigation and preparedness now.⁴⁶³

Flooding and Extreme Rainfall

Flood risk in Hawai‘i has multiple drivers: intense rain from kona lows and tropical cyclones; flash runoff from short, steep watersheds; and coastal flooding from storm surge layered on higher seas. Projections show more frequent very heavy downpours even as some areas trend drier overall.⁴⁶⁴ Hawai‘i’s drainage systems have frequently been overwhelmed by the compounding effects of high tides with above-average precipitation. In 2018, a storm delivered 49.69 inches in 24 hours on Kaua‘i, a U.S. record⁴⁶⁵ which damaged homes, roads, agriculture, and cultural sites, overwhelming drainage infrastructure designed for milder conditions. In 2017, and again in 2020, storm drains in Waikiki failed, flooding surrounding areas with potentially contaminated water.⁴⁶⁶ These events underscore the importance of upland restoration, updated design approaches such as riparian buffers along waterways, appropriately sized drainage infrastructure, overflow pathways that direct water away from homes, restored floodplains, and improved stormwater management practices which are increasingly considered in State and county planning.

⁴⁶² Frazier, A.G., M.-V.V. Johnson, L. Berio Fortini, C.P. Giardina, Z.N. Grecni, H.H. Kane, V.W. Keener, R. King, R.A. MacKenzie, M. Nobrega-Olivera, K.L.L. Oleson, C.K. Shuler, A.K. Singeo, C.D. Storlazzi, R.J. Wallsgrove, and P.A. Woodworth-Jefcoats. (2023). Ch. 30. Hawai‘i and US-Affiliated Pacific Islands. In: Fifth National Climate Assessment. Crimmins, A.R., C.W. Avery, D.R. Easterling, K.E. Kunkel, B.C. Stewart, and T.K. Maycock, Eds. U.S. Global Change Research Program, Washington, DC, USA. <https://doi.org/10.7930/NCA5.2023.CH30>

⁴⁶³ Hawai‘i Emergency Management Agency & Department of Defense. (n.d.) *Five Year Strategic Plan 2020-2025*. Accessed from Final-2020-Strategic-Plan.pdf ; A. Hittle, and N. Hedge, "State of Natural Resource Financing in Hawai‘i: Current Funding and Future Needs for Climate Resilience," Technical Report prepared for the Care for ‘Āina Now Coalition, 2024

Stevens, L.E., R. Frankson, K.E. Kunkel, P.-S. Chu, and W. Sweet, 2022: *Hawai‘i State Climate Summary 2022*. NOAA Technical Report NESDIS 150-HI. NOAA/NESDIS, Silver Spring, MD, 5 pp.

⁴⁶⁵ County of Kaua‘i. (2021). *Action Plan for Disaster Mitigation*. Accessed from mitigation-funding-draft-action-plan_final_approved_01.2022.pdf.

⁴⁶⁶ Obara, C., Fletcher, C.H., Habel, S. et al. *Drainage failure and associated urban impacts under combined sea-level rise and precipitation scenarios*. *Sci Rep* **15**, 23436 (2025). <https://doi.org/10.1038/s41598-025-07332-8>

Drought

The ongoing climate crisis is exacerbating statewide drought conditions and the threat of future water shortages. This is impacting the State's freshwater resources and the availability of both groundwater and stream flows. Declining water availability stresses agriculture, ecosystems, aquifers, and communities, while setting the stage for wildfire. The Hawai'i Drought Plan details vulnerabilities and coordination measures⁴⁶⁷ and the U.S. Drought Monitor chronicles multi-year episodes across the islands, including the current status of drought conditions statewide.⁴⁶⁸ The Hawai'i section of the 2022 State Climate Summary notes broad declines in annual rainfall since the 1980s and continued warming, which can lead to more frequent or severe drought in many areas.⁴⁶⁹ Effective drought preparedness will depend on integrated watershed management, improved water-use efficiency, and coordination between drought and wildfire planning.

Wildfire

Strong gradient winds, unmanaged lands, and human ignition sources, such as downed or sparking electrical lines, vehicles and equipment on dry grass, open flames, and arson, have created fast-moving grass-fire regimes across leeward landscapes. Wildfire frequency has risen markedly over the last century, driven by land-use change and invasive grasses, then compounded by periods of drought.⁴⁷⁰ Statewide policies on vegetation management, home and neighborhood fireproofing, and equitable financing can serve as pillars of a new wildfire strategy focused on prevention and safer recovery. On-the-ground wildfire resilience requires managing the spread of invasive grasses around communities and critical facilities, establishing firewise communities, creating firebreaks and improving neighborhood-level evacuation and communication systems so people can move quickly and safely during fast-moving events.⁴⁷¹

Heat

Temperatures have risen across the islands on average about 2°F since the 1950's.⁴⁷² Climate models expect temperatures to increase and additional 2-6 °F.^{473,474} Higher temperatures have had impacts on the ability of children to learn in classrooms and increase risk of heat related illness.

⁴⁶⁷ Hawai'i Department of Land and Natural Resources, Natural Resources Commission on Water Management. (2017). *Revised Hawai'i Drought Plan, 2017 Update*. Accessed from HDP2017.pdf.

⁴⁶⁸ U.S Drought Monitor. Drought Map. Accessed from Current Map | U.S. Drought Monitor.

⁴⁶⁹ Stevens, L.E., R. Frankson, K.E. Kunkel, P.-S. Chu, and W. Sweet, 2022: *Hawai'i State Climate Summary 2022*. NOAA Technical Report NESDIS 150-HI. NOAA/NESDIS, Silver Spring, MD, 5 pp.

⁴⁷⁰ State of Hawai'i Emergency Management Agency. (2023, August). *State of Hawai'i 2023 Hazard Mitigation Plan*. Accessed from 2023 Hawaii State Hazard Mitigation Plan

⁴⁷¹ Hawai'i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*.

⁴⁷² Thomas C. Peterson and Russell S. Vose (1997): Global Historical Climatology Network - Monthly (GHCN-M), Version 3. NOAA National Centers for Environmental Information. <https://doi.org/10.7289/V5X34VDR>

⁴⁷³ Jay H. Lawrimore, Matthew J. Menne, Byron E. Gleason, Claude N. Williams, David B. Wuertz, Russell S. Vose, and Jared Rennie (2011): *Global Historical Climatology Network - Monthly (GHCN-M), Version 3*. NOAA National Centers for Environmental Information. doi:10.7289/V5X34VDR Accessed December 2, 2025.

⁴⁷⁴ J. H. Lawrimore, M. J. Menne, B. E. Gleason, C. N. Williams, D. B. Wuertz, R. S. Vose, and J. Rennie (2011), *An overview of the Global Historical Climatology Network monthly mean temperature data set, version 3*, J. Geophys. Res., 116, D19121, doi:10.1029/2011JD016187.

Increased temperatures also mean dryer landscapes leading to drought and fire risk. State and County planning agencies look to solution such as shade and ventilation that improve micro-climates.⁴⁷⁵ In addition, City & County of Honolulu’s Department of Planning and Permitting (DPP) has “Area Adaptation Plans” and “Urban Design Plans” which aim to address built-environment responses to climate, including site layout, open space, and shading/airflow patterns.⁴⁷⁶ The effectiveness of these design standards depends in part on policy framework language, specific quantifiable metrics and permitting capacity, which is already strained by housing and clean-energy demands.

Water Security

Most climate change impacts result in either too much or too little water. Ensuring there is enough freshwater available when and where we need it is increasingly becoming a challenge. All of Hawai‘i’s freshwater comes from rainfall that has filtered through our native forests, our volcanic soil and into our aquifers and streams. As sea levels rise, aquifers are susceptible to saltwater intrusion causing the groundwater table to rise, flooding low lying areas and reducing the volume of freshwater they can hold.⁴⁷⁷ Drought, development and the conversion of forests to non-native species limit the availability of water to replenish the aquifers and streams. Inefficient use of water, watering during peak hours, using potable water to irrigate uses such as golf courses, and water system leaks drain aquifers and streams more quickly than they can replenish. Protecting freshwater resources requires coordination across jurisdictions and ongoing innovation in water management, particularly as climate impacts compound existing stresses on supply. The City and County of Honolulu are approaching this task through the “One Water” method which considers the water cycle an integrated system, similar to the ahupua‘a system, recognizing the connections between stormwater, groundwater, wastewater, and sea water and the relationship between land and water. Earlier this year the PGA Tour canceled its Sentry golf tournament in Kapalua, Maui due to drought, leaving many local businesses concerned about the loss of revenue the tournament typically provides. The drought is impacting the majority of the people on Maui, including traditional and customary practices such as lo‘i cultivation, and is bringing to light the complexities of balancing water usage amongst competing interests.

Sea Level Rise

In 2017, and again in 2020, the Honolulu Harbor Tide gauge recorded its highest daily mean water levels observed over its 112-year history. These events provide a glimpse of what Hawai‘i will experience as sea level continues to rise. Local impacts included flooded streets, underwater beaches, and impeded access to coastal trails. Sea level responds to greenhouse gas emissions more slowly than other impacts, therefore sea level rise (SLR) will continue regardless of any mitigation

⁴⁷⁵ <https://planning.hawaii.gov/hawaii-state-planning-act/>

⁴⁷⁶ <https://www.honolulu.gov/dpp/planning/>

⁴⁷⁷ Pawlak, G. R., & Lowe, R. J. (2023). *Hidden Threat: The Influence of Sea-Level Rise on Coastal Groundwater and the Convergence of Impacts on Municipal Infrastructure*. University of Hawai‘i Sea Grant College Program / Coastal Resilience Center. <https://www.soest.hawaii.edu/crc/publications/annurev-marine-020923-120737.pdf>

actions.⁴⁷⁸ The state is expecting 4 feet of sea level rise by 2100.⁴⁷⁹ As the science progresses towards increasingly concerning rates of sea level rise for Hawai‘i, it remains imperative that the legislature and state and county agencies maintain a long-term focus on building resiliency to rising seas by reducing overall vulnerability of infrastructure and implementing adaptation measures to allow our state to continue to thrive with higher seas.

Infrastructure

Hawai‘i’s infrastructure is increasingly strained by climate change, with sea level rise, stronger storms, drought, and wildfire all affecting the systems that communities rely on daily. More than 270 miles of state roads and dozens of bridges are exposed to coastal flooding, erosion, and storm surge, leaving some neighborhoods vulnerable to isolation when road segments fail, particularly in areas with single-access routes.⁴⁸⁰ The protection of roads exposed to climate risks especially sea level rise hazards may not be cost effective in the future. This means that exposed assets, and often adjacent assets, may need to be relocated or elevated. Schools and homes are also in an increasingly perilous position. Coastal erosion, associated with higher waves brought by sea level rise and powerful storm surges, work away at infrastructure near coastlines. In extreme cases, communities and their economic activities may need to be relocated. When shoreline or low-lying road segments fail, entire neighborhoods can be cut off from emergency services and basic supplies, especially in communities with single-access roads along the coast or through narrow valleys. During fast-moving storm events, the loss of even a short road segment or one bridge can eliminate evacuation routes, forcing shelter-in-place scenarios and delaying medical response and recovery logistics. These events give us valuable insight about what we can expect when sea level rise impacts coincide with extreme weather events, like above average precipitation.

At the same time, areas with invasive grasses and drought conditions put varying developments at risk. Energy infrastructure mitigation measures such as vegetation management, pole hardening, undergrounding, and microgrids that benefit disadvantaged communities, and protect community lifelines, and have a high likelihood of implementation are increasingly needed as wildfire risk increases. HSEO is supporting projects such as the Synchronous Condenser Conversion Technology (SCCT) project which will provide significant regional and community benefits by reducing the likelihood and consequence of disruptive events that would otherwise destabilize the system. This novel use of grid-inertia technology in a grid of Kaua‘i’s size will demonstrate a replicable solution for local, regional, and interregional grid enhancement and decarbonization, providing a reference case for duplication of the conversion technology in other jurisdictions.

⁴⁷⁸ Arias, Paola & Bellouin, Nicolas & Coppola, Erika & Jones, Christopher & Krinner, Gerhard & Marotzke, Jochem & Naik, Vaishali & Plattner, Gian-Kasper & Rojas, Maisa & Sillmann, Jana & Storelvmo, Trude & Thorne, Peter & Trewin, Blair & Achutarao, Krishna & Adhikary, Bhupesh & Armour, Kyle & Govindasamy, Balasubramanian & Barimalala, Rondrotiana & Berger, Sophie & Zickfeld, Kirsten. (2021). *Climate Change 2021: The Physical Science Basis*. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change; Technical Summary.

⁴⁷⁹ Stevens, L.E., R. Frankson, K.E. Kunkel, P.-S. Chu, and W. Sweet, 2022: *Hawai‘i State Climate Summary 2022*. NOAA Technical Report NESDIS 150-HI. NOAA/NESDIS, Silver Spring, MD, 5 pp.

⁴⁸⁰ Hawai‘i Department of Transportation, Hawai‘i Highways Climate Adaptation Action Plan <https://hidot.hawaii.gov/wp-content/uploads/2021/07/HDOT-Climate-Resilience-Action-Plan-Exposure-Assessments-April-2021.pdf>

Emergency Preparedness Gaps and Needs

As climate hazards intensify, communities are experiencing widening challenges in disaster readiness, response, and recovery. After the 2025 Tsunami warning Oahu, traffic was slow-going all around the island revealing persistent gaps in evacuation planning, access to emergency information, and support systems for mobility-limited residents, renters, and rural or single-access communities. Many households report uncertainty about where to go, how to evacuate safely, or how to access assistance programs during fast-moving crises. While counties and community organizations provide training and outreach, preparedness levels vary significantly across neighborhoods, and communication systems can falter when power or cellular networks fail. These gaps underscore the need for stronger community-based response capacity, clearer evacuation strategies, expanded training programs, and more accessible recovery resources to ensure all residents can navigate emergencies safely and recover more quickly.

Impacts to Natural Resources

Hawai‘i’s natural systems including forests, reefs, wetlands, streams, and coastal ecosystems form the foundation of the islands’ ecological integrity, cultural identity, economy and community wellbeing. Due to geographic isolation, high rates of endemism, Hawai‘i is among the most ecologically vulnerable places in the United States. Climate change is now disrupting these natural systems in ways that affect both biodiversity and the cultural practices and livelihoods that depend on them.

Across the Hawaiian Islands, rising temperatures, changing rainfall patterns, sea-level rise, ocean warming and acidification, and the spread of invasive species and diseases are creating widespread ecological stress. These shifts are contributing to more frequent coral bleaching events, accelerating erosion of beaches and coastal cliffs, reduced streamflow and aquifer recharge, habitat degradation, and increased wildfire risk driven by invasive grasses. Many native species already limited to small ranges are now further threatened by these climate pressures. Forest birds that can no longer access high-elevation refuges as avian malaria expands upslope with warming temperatures, and species that thrive in cooler temperatures no longer have higher elevations to relocate.^{481,482}

While multiple agencies and community partners are engaged in efforts to protect and restore ecosystems across the islands, significant challenges persist. Invasive species remain deeply entrenched and difficult to manage across landscapes with fragmented ownership. Restoration is costly and often dependent on project-specific or short-term funding streams, making long-term planning difficult. Climate projections for hydrology and rainfall streamflow outpace the ability of regulatory frameworks to respond. Capacity limitations also affect communities, many of whom lack the resources, technical assistance, or legal support needed to lead local adaptation efforts.

⁴⁸¹ DLNR DOFAW. (2023). Forests and Carbon Projects. <https://dlnr.hawaii.gov/forestry/carbon>

⁴⁸² EcoAdapt. (2018). Hawaiian Islands Climate Vulnerability and Adaptation Synthesis Report. https://www.cakex.org/sites/default/files/documents/EcoAdapt_Hawaiian%20Islands%20Climate%20Vulnerability%20and%20Adaptation%20Synthesis%20Report_January2018.pdf

This is exacerbated by cultural disconnection in younger generations that threatens the continuity of traditional ecological knowledge essential for effective ‘āina-based stewardship.

Long-term resilience for Hawai‘i’s natural resources depends on coordination across agencies and communities, stable funding, and innovative approaches that are culturally grounded. One such innovative approach is the Maui Landscape Conservation Design. The framework allows wildlife managers to integrate multiple species, populations, and locations into their conservation planning efforts. It leads users through a series of steps where they first identify the species at risk of extinction, then use existing species and habitat information and spatial modeling to determine the most effective conservation sites, priority actions, and monitoring and adaptation efforts needed to best conserve those species across the landscape. Importantly the framework leverages actions to be inclusive of surrounding ecosystems increasing the efficiency of resource management, saving money and increasing cross boundary collaborations.

Expanded restoration of native ecosystems, especially dry and mesic forests, is critical for biodiversity, watershed function, and wildfire prevention. Protecting freshwater resources will depend on stream restoration, watershed management, and minimum flow policies that uphold ecological and cultural needs. Coastal areas and coral reefs require stronger protections to reduce land-based pollution, manage coastal development, and support reef recovery projects as bleaching events become more frequent. These ecological strategies must be integrated into land use planning, infrastructure siting, and emergency management to ensure that natural systems are recognized as essential components of resilience.

Strengthening the integration of traditional ecological knowledge and supporting co-management agreements with community practitioners will be essential. Stable, long-term funding through State appropriations, federal grants, and ecosystem-service payment mechanisms will provide the continuity needed for large-scale restoration. Improved coordination across agencies and sectors can help address cross-boundary impacts at watershed or ahupua‘a scales. Building local capacity through community-based organizations and cultural institutions will ensure that adaptation remains place-based and communities are empowered to steward resources. Finally, deeper public engagement in climate literacy, cultural practices, and stewardship can help strengthen the social foundations of resilience. Taken together, these actions create a pathway for protecting Hawai‘i’s unique ecosystems and the cultural lifeways intertwined with them. As climate pressures intensify, the health of natural systems will continue to shape the resilience, identity, and future of Hawai‘i’s communities.

Current Actions Strengthening Hawai‘i’s Climate Resilience

Hawai‘i is already undertaking significant work across agencies, counties, and communities to strengthen resilience to climate hazards. These efforts form the foundation on which the recommendations in this chapter build. State and county governments have developed a suite of adaptation and hazard mitigation plans, including the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report, county Hazard Mitigation Plans, Ola O‘ahu Resilience Strategy, the Hawai‘i Highways Climate Adaptation Action Plan, and numerous watershed and coastal management plans that identify priority risks and outline strategies for reducing vulnerability. Many of the

recommendations in this chapter advance or scale actions already identified in these planning documents.

Statewide emergency preparedness is led by HI-EMA, which coordinates response planning, evacuation protocols, and training with county emergency management agencies. Counties are also expanding their readiness through updated emergency plans, local hazard mapping, community response training, and investments in critical facilities. HDOT is evaluating shoreline roads, addressing flooding hotspots, and incorporating climate impacts into transportation asset management. HSEO and electric utilities continue to invest in grid hardening, microgrids, vegetation management, wildfire-risk planning, and projects such as synchronous condenser conversion to improve grid stability.

Natural resource protection is also underway across agencies and conservation partners. DLNR and watershed partnerships carry out large-scale forest restoration, fencing, invasive species control, riparian management, and post-fire erosion mitigation. Coastal programs support dune restoration, reef protection, wetland management, and loko i‘a revitalization through efforts such as the Ho‘āla Loko I‘a program. Counties are advancing green infrastructure, stormwater projects, and nature-based solutions through planning and permitting reforms to help stabilize shorelines, improve water quality, and reduce downstream flood risk.

Communities and nonprofit organizations are playing an increasingly central role in preparedness and adaptation. Islandwide networks of community organizations are continuing to operate and expand resilience hubs and mutual-aid systems that support residents during outages, storms, and heat events. Neighborhood-level initiatives such as emergency planning workshops, mutual-aid networks, cultural resilience programs, youth leadership, and localized hazard education demonstrate the power of community-led adaptation. Counties are partnering with schools, churches, nonprofits, and local leaders to improve readiness through Hawai‘i Hazards Awareness and Resilience Program (HHARP) trainings, communication tools, and partnerships that integrate trusted messengers into emergency response systems.

Efforts to strengthen and stabilize the local food system and support small producers are ongoing. The state is connecting food security programs with local producers. These efforts bolster food resilience during supply-chain disruptions and strengthen long-term economic stability for local producers.

Collectively, these current actions demonstrate significant statewide momentum toward more resilient communities, ecosystems, and infrastructure. The recommendations that follow aim to build on this foundation by scaling what is already working, improving coordination across agencies and sectors, and accelerating investments that reduce risk and protect Hawai‘i’s most vulnerable residents.

Community Resilience and Food Hubs

Climate hazards increasingly strain Hawai‘i’s communities, and often the impacts fall most heavily on rural and underserved areas facing limited resources, transportation barriers, aging facilities, and gaps in technical capacity. Building resilience requires approaches rooted in community realities, supported by stable funding, technical assistance, and long-term partnerships. Within this

context, the expansion of resilience food hub networks has emerged as a key strategy for strengthening both everyday wellbeing and disaster readiness.

Resilience hubs are community-serving spaces or networks that can range from neighborhood centers, shelters, schools, and pop-up aid-distribution sites to informal community groups that provide resources, services, and support to residents both in everyday times and during emergencies. These hubs operate effectively because they draw on existing social infrastructure, trusted local leadership, and deep knowledge of community needs. In practice, resilience hubs help activate what many neighborhoods already rely on: local spaces, community assets, relationships, and local resources that can be mobilized long before formal assistance arrives.

In everyday conditions, resilience hubs may host cultural programming, educational activities, youth engagement, kūpuna support, wellness services, and basic resources that strengthen community stability. Strengthening daily wellbeing directly improves disaster outcomes, as communities with reliable gathering places and strong social networks recover more quickly and face fewer health and safety impacts. During emergencies, hubs can shift quickly to higher levels of service, providing safe gathering spaces, cooling during heat waves, clean air during wildfire smoke, device charging, refrigeration for medications, water filtration, first aid, and trusted communication channels. For neighborhoods that experience delays in utility restoration or have limited access to emergency services, hubs provide localized readiness and response capacity that fills critical gaps.

Resilience hubs may often function as networks rather than isolated sites. Vibrant Hawai‘i operates a distributed hub system on Hawai‘i Island, providing year-round programming and rapid activation during storms, wildfires, and extended outages. Their approach emphasizes mutual aid, peer learning, and coordinated resource sharing to ensure that no neighborhood is left isolated. On O‘ahu, Community Engagement for Resilient Neighborhoods (CERENE) supports community organizations as they develop operational plans, acquire equipment, build communication systems, and coordinate with county agencies. These efforts highlight that resilience is strongest when led by the people who live and work in each community.

Yet many hubs face persistent readiness challenges driven by volunteer fatigue, limited staffing, unclear roles during emergencies, and gaps in trusted information flow. These structural barriers reduce preparedness long before hazards occur. Strengthening resilience requires not only physical investment but also sustained coordination, locally grounded communication networks, and stable funding so hubs can operate consistently and reliably. Increasing state support enhances emergency preparedness as well as everyday cohesion, wellbeing, and self-reliance.

Food hubs complement resilience hubs by strengthening Hawai‘i’s food system. Under ACT 313 (2022), the State’s Food Hub Pilot Program recognizes the importance of local aggregation and distribution centers for supporting producers and improving food access, especially in underserved communities. Food hubs coordinate the collection, storage, processing, and distribution of locally grown products, building reliable markets for farmers while reducing reliance on imported goods. As climate change disrupts supply chains through shipping delays, port closures, drought, or extreme weather, food hubs provide a stabilizing backbone for in-state food distribution and food

security. They also bolster economic resilience by keeping more food dollars circulating locally and supporting jobs in agriculture and distribution.

Together, resilience hubs and food hubs form complementary systems that help Hawai‘i withstand, adapt to, and recover from climate impacts. Resilience hubs provide trusted spaces, equipment, and relationships for readiness and response, while food hubs ensure communities have dependable access to local food and distribution capacity during disruptions. Integrating these systems strengthens neighborhood self-reliance, reduces vulnerability, and supports a more equitable, culturally grounded, and durable model of resilience across Hawai‘i’s islands.

Recommended Actions

Hawai‘i’s accelerating climate hazards are already affecting homes, infrastructure, natural resources, and cultural sites across the islands, and these impacts are not evenly distributed. Communities with fewer financial resources, older housing, limited transportation access, or single evacuation routes face greater exposure and slower recovery. While many of the responses needed to address these risks are embedded throughout other chapters of this CAP, including energy, transportation, housing, agriculture, natural resources, and the circular economy, the following recommendations focus on the cross-cutting resilience and adaptation actions not fully captured in those sector pathways. These include measures related to emergency preparedness, insurance access and affordability, and community-based readiness. Together, the recommendations that follow aim to strengthen everyday resilience, protect lives, and minimize long-term costs in the face of intensifying climate impacts.

Implement Existing State and County Recommendations

Counties and State agencies have developed resilience and adaptation plans and along with them recommendations for action. The State, including CCMAC, can play a central coordinating role by providing technical assistance, identifying multijurisdictional opportunities, and supporting implementation of shared priorities across such plans. The State can conduct a deeper analysis to identify where county collaboration and/or State support would be beneficial across the following such plans:

Kaua‘i Climate Adaptation and Action Plan⁴⁸³

Integrated Climate Action Plan for the Island of Hawai‘i⁴⁸⁴

Ola The Oahu Resilience Strategy⁴⁸⁵

HIEMA Hazard Mitigation Plan⁴⁸⁶

Hawai‘i County Muli Hazard Mitigation Plan⁴⁸⁷

⁴⁸³ KCAAP_PublicDraft_PartII_032425-1.pdf

⁴⁸⁴ <https://www.hawaiicounty.gov/home/showpublisheddocument/308256/638618168911000000>

⁴⁸⁵ Resilience Strategy — Resilience Office - City and County of Honolulu Office of Climate Change, Sustainability and Resiliency

⁴⁸⁶ dod.hawaii.gov/hiema/files/2025/10/2023_Hawaii_SHMP_Final_Approved_Adopted_508Compliant-102723.pdf

⁴⁸⁷ <https://hawaiicountygis.maps.arcgis.com/sharing/rest/content/items/b27e240f7119410395e4b356f402ece8/data>

County of Maui Hazard Mitigation Plan⁴⁸⁸
City and County of Honolulu Local Hazard Mitigation Plan⁴⁸⁹
Climate Ready O‘ahu⁴⁹⁰
County of Maui Climate Action Resiliency Plan.⁴⁹¹
Kaua‘i Multi-Hazard Mitigation and Resilience Plan⁴⁹²
Sea Level Rise Vulnerability Assessment⁴⁹³
Hawai‘i Highways Climate Adaptation Action Plan^{494, 495}
Coordinated support accelerates implementation and ensures consistent approaches to resilience across counties.

Emergency Preparedness and Disaster Support

Publish Clear Disaster Housing Guidance. Publish a plain-language guide on temporary housing benefits (Hawaii Relief Program, FEMA, Hawaii Fire Relief Housing/Helping Maui Housing program) and create a disaster insurance help desk for real-time survivor support.

Expand and Strengthen Resilience & Food Hubs. Expand and strengthen community resilience hubs and food hubs as complementary systems that bolster local preparedness and everyday wellbeing. Hawai‘i can grow existing resilience-hub networks by providing flexible funding, technical assistance, and essential equipment so hubs can offer cooling, air filtration, device charging, water, medication-grade refrigeration, and trusted local coordination before, during, and after emergencies. These hub networks can also support additional resilience-building programs such as tool libraries, repair and material-reuse circles, microgrid development, emergency readiness activities, and job or skill-training opportunities which will enhance community capacity year-round. At the same time, expanding and integrating the state’s food hub network creates a reliable backbone for food security during disasters. By coordinating these two systems, communities gain both the physical spaces and the supply-chain support needed to distribute essential resources, sustain local producers, and strengthen neighborhood self-reliance during disruptions.

COST: \$60 million over 5 years for the resilience hubs actions. According to the Climate Advisory Team’s policy recommendations, developing and sustaining resilience hubs across Hawai‘i is

⁴⁸⁸ 2025-County-of-Maui-Hazard-Mitigation-Plan

⁴⁸⁹ Local Hazard Mitigation Plan 2025 | Department of Emergency Management

⁴⁹⁰ City and County of Honolulu Office of Climate Change, Sustainability and Resiliency. (2024). *Climate Ready O‘ahu*. <https://www.resilientoahu.org/climatereadyoahu>

⁴⁹¹ County of Maui (2022) Climate Action Resiliency Plan. <https://hi-maui-county-mapps.civicplus.com/326/Climate-Action-Resiliency-Plan>

⁴⁹² 2021-05-04_kauaicomtyhmp-vol.1_final.pdf

⁴⁹³ Hawai‘i Sea Level Rise Vulnerability and Adaptation Report

⁴⁹⁴ Hawai‘i Department of Transportation, Hawai‘i Highways Climate Adaptation Action Plan <https://hidot.hawaii.gov/wp-content/uploads/2021/07/HDOT-Climate-Resilience-Action-Plan-Exposure-Assessments-April-2021.pdf>

projected to cost approximately \$12 million per year, reflecting the resources needed to support community-driven planning, design, and ongoing operations of these hubs.⁴⁹⁶

Develop Multimodal Evacuation Pathways. Expand multimodal evacuation pathways by upgrading bike and trail corridors that can function as alternate access routes during emergencies. Improve transportation corridors with heat-reducing and stormwater-managing features such as shade structures, street trees placed outside hazard zones, and green infrastructure while ensuring evacuation routes remain safe, unobstructed, and wildfire- and storm-resilient.

Promote Low-Congestion Evacuation Transportation. Incentivize/promote alternate transportation methods (bus, bicycles, electric bicycles, scooters) as viable evacuation vehicles to avoid congestion that slows evacuation times.

Coordinate Evacuation Training and Response. Provide coordinated evacuation responses, which includes: preemptive trainings and community outreach (e.g. community fire drills, hurricane drills, and tsunami drills), procedures for mobility-limited residents (e.g. TheHandi-Van as an evacuation vehicle), and roadway prioritization for first responders.

Expand and Modernize HHARP. Expand HHARP to increase community participation, offer multi-hazard training tailored to wildfire, flooding, extreme heat, and prolonged outages, and provide micro-grants for community-led preparedness activities. Update program materials to improve accessibility, cultural relevance, and multilingual communication, and integrate HHARP more tightly with resilience hubs and county emergency management operations.

Insurance

Improve FEMA CRS Ratings for Flood Insurance Discounts. Lower counties' CRS class ratings to increase NFIP flood insurance discounts for residents and businesses. Provide targeted technical assistance to expand floodplain management activities, improve documentation, and strengthen county capacity to meet CRS program standards. Priority should be given to LIDAC communities facing high flood risk and socioeconomic burdens. Track and publicly report the annual premium savings generated through improved CRS ratings to demonstrate benefits to households and reinforce continued investment in community resilience.

Standardize Insurance Claim Timelines and Reporting. Establish clear timelines for insurance claim processing and require anonymized claim data reporting so the State can identify where delays, denials, or underinsurance are occurring. This transparency would help ensure that people are treated fairly, that underinsurance problems are recognized early, and that communities receive

⁴⁹⁶ Hawai'i Climate Advisory Team (2025, January). *Climate Disaster Resilience, Recovery, and Funding*. Accessed from https://static1.squarespace.com/static/66b44b3a2e30510c5c62fe1f/t/67da2dfab6b12c479c6b90a2/1742351889292/Climate+Advisory+Team+Policy+Recommendations+on+Climate+Disaster+Resilience%2C+Recovery%2C+and+Funding+-+DIGITAL+-+Feb+2025_compressed.pdf

timely support when they need it most. Legislative or executive action will be needed to ensure consistent compliance across carriers.

Provide Targeted Premium Assistance and Last-Resort Coverage. Last-resort insurance is a post-disaster safety net that provides swift, limited financial assistance to the most vulnerable survivors. This type of support would activate after qualifying catastrophic events, helping households cover immediate recovery costs without replacing private insurance or reducing incentives to take protective measures. Provide premium assistance and a narrowly state-supported reinsurance or last-resort coverage that keeps insurance available when private insurers withdraw from high-risk areas or during a state of emergency or other extreme circumstances. Premium support and last resort coverage should be time-limited, targeted, and contingent on documented risk- so public dollars improve affordability by lessening loss, not just shifting costs.

Monitoring and Metrics to Track Progress

Because climate conditions are evolving quickly, Hawai‘i needs a consistent way to learn from experience and adjust its resilience strategy over time. Annual public “resilience scorecards” can provide a simple, transparent tool to track whether recommended actions are reducing physical risk, improving community wellbeing, and delivering economic benefits. By reporting clear indicators each year, the State can course-correct as conditions change and direct resources toward the most effective interventions.

Hawai‘i already has a strong foundation for this type of tracking through the Aloha+ Challenge Dashboard, developed by Hawai‘i Green Growth (HGG). The State can build on this existing system by integrating a focused set of climate resilience metrics aligned with the resilience measures in the CAP. Expanding the dashboard in this way leverages a well-established platform to ensure accountability to residents and the Legislature while creating a unified, statewide approach to measuring resilience progress.

Decreasing risks. Track the measurable reductions in physical exposure and hazard vulnerability resulting from completed actions. This includes the number of homes statewide strengthened to modern wind, flood, and wildfire standards; defensible space maintained near communities; improvements to stormwater and drainage systems completed; flood- and heat-reducing green infrastructure installed; shoreline protection and watershed restoration projects completed; and the extent of invasive grass removal and other fuels-management activities.

Human impacts. Equally important are indicators that reflect human outcomes. These include usage of resilience hubs during extreme weather or outage events (where feasible and hubs track these services), reduced disaster-related injuries or heat-related illness, fewer school and medical disruptions, and decreased displacement days following severe events. These metrics make it possible to evaluate whether resilience efforts are meaningfully improving community wellbeing.

Economic implications. Track how resilience actions reduce disruptions and strengthen the local economy. This includes avoided losses per public dollar invested; reductions in outage hours for power, water, and communications; emergency spending avoided by counties; and the local jobs and wages created through home retrofits, green infrastructure, watershed restoration, coastal

protection, and hub operations. Emphasizing in-state spending and local hiring can further reinforce economic benefits.

Key Agencies

Hawai‘i’s climate resilience depends on a coordinated network of agencies spanning state, county, academic, and community partners. Each plays a distinct role in shaping land use decisions, safeguarding critical infrastructure, managing natural resources, and ensuring communities are prepared for and able to recover from climate-driven hazards. Strong alignment across these entities is essential for translating statewide climate goals into on-the-ground action.

Statewide Agencies

The Office of Planning and Sustainable Development (OPSD) is guided by the Hawaii State Planning Act, which is a broad policy document to “improve the planning process in this state, to increase the effectiveness of government and private actions, to improve coordination among different agencies and levels of government, to provide for wise use of Hawaii’s resources and to guide the future development of the state” (HRS § 226-1). The Act is codified under HRS Chapter 226.

Hawai‘i Climate Change Mitigation and Adaptation Commission (CCMAC) serves as a statewide convener and provides policy recommendations to advance climate resilience and adaptation.

The Hawai‘i Emergency Management Agency (HIEMA) plans for and responds to both natural and human-caused emergencies, including tsunamis, wildfires, hurricanes, hazardous materials incidents, and other threats. HIEMA is the coordinating agency on emergencies of all kinds between federal and local agencies, including the four county emergency management agencies and the Federal Emergency Management Agency (FEMA).

The Hawai‘i State Energy Office (HSEO) oversees energy system resilience, grid modernization, and decarbonization strategies that support a more reliable and resilient energy system.

Hawai‘i Department of Transportation (HDOT) manages transportation assets, including roads, bridges, ports, and airports, and maintains evacuation routes and other critical transportation infrastructure vulnerable to climate hazards.

County Agencies:

Hawai‘i County Civil Defense Agency includes responsibilities for natural disasters and emergencies, coordinating emergency response, public safety, information dissemination, mutual aid, shelter provision, and overall emergency preparedness.

Maui Emergency Management Agency (MEMA) mission is to ensure the safety and resilience of Maui Nui through coordinated planning, hazard preparedness, and emergency response.

Kauai Emergency Management Agency's mission statement is to protect lives and property in the County of Kaua'i by coordinating and integrating efforts among all levels of government and the private sector to mitigate against, prepare for, respond to and recover from natural disasters, acts of terrorism and other threats and hazards.

The City and County of Honolulu's Department of Emergency Management (DEM) coordinates preparedness and response plans, programs, and initiatives with city, state, federal, private, corporate, and non-government entities. DEM was established in 2007 by Chapter 127A-5⁴⁹⁷ of the Hawai'i Revised Statutes, and Section 6-103, page 34 of the Revised Charter of the City and County of Honolulu. Prior to 2007, the department was known as the O'ahu Civil Defense Agency.

Hawai'i County Planning Department provides technical advice to the Mayor, Planning Commission, and County Council on all planning and land use matters. The Department is also charged with the administration of the Subdivision and Zoning Codes. The major divisions of the department are Administrative Services, Administrative Permits, Long-Range Planning, Planning, and West Hawai'i.

Maui Department of Planning offers technical advice to the Mayor, County Council and commissions; proposes zoning legislation; drafts updates to the General Plan, Maui Island Plan and Community Plans; presents reports & recommendations on development proposals; and oversees programs on cultural resources, census and geographic information, flood plain permits and other special projects and permits.

Kauai Planning Department advises the Mayor, Planning Commission, and the County Council on planning and land use matters for the County of Kauai. The Department is also responsible for the administration and enforcement of the Zoning and Subdivision Ordinances, as well as the County's planning program, which includes long-range and regulatory policy documents like the General Plan and Comprehensive Zoning Ordinances.

The City and County of Honolulu's Department of Planning and Permitting (DPP) has "Area Adaptation Plans" and "Urban Design Plans" which aim to address built-environment responses to climate, including site layout, open space, and shading/airflow patterns.

Maui County Environmental Protection & Sustainability (EP&S) guides and funds environmental initiatives around natural resource protection, sustainability, conservation, and restoration. The Division fosters partnerships with government agencies and community leaders to enforce environmental legislation and support innovative programming, community-based initiatives, and public education. EP&S is committed to building a sustainable community with Mālama 'Āina as its guiding principle.

The Office of Sustainability, Climate, Equity, and Resilience (OSCER) empowers Hawai'i Island's self-reliance by uniting County departments and the community to share knowledge, build capacity, and coordinate resources related to sustainability, climate action, equity, and resilience.

⁴⁹⁷ Chapter 127A, "Emergency Management." 2024 Hawai'i Revised Statutes.

The City and County of Honolulu’s Office of Climate Change, Sustainability and Resiliency coordinates and supports resilience and adaptation planning across all City departments and agencies. The Resilience Office led development and coordinates implementation of the O’ahu Resilience Strategy, Climate Ready O’ahu—the City’s climate adaptation strategy—and the City’s Long-Term Disaster Recovery Plan, the strategies and actions of which, together, work to prepare and safeguard community, ‘āina and infrastructure from climate hazards today and for future generations.

Research and Academic Partners:

The University of Hawai‘i system provides scientific, technical, and research expertise to support climate impact analysis, hazard modeling, engineering solutions, and resilience planning.

Community and Nonprofit Partners:

Community Engagement for Resilient Neighborhoods (CERENE) supports the growing network of community resilience hubs on O’ahu and help facilitate conversations regarding specific needs associated with new Hubs here.

Vibrant Hawai‘i builds capacity for community-led resilience hubs across Hawai‘i Island and throughout the state, and is focusing on strengthening community networks, mutual aid, and local response capabilities. Their approach is unique and focused on the building the strength of a hub network in tandem with increasing capacity of individual community Hubs.

Even as Hawai‘i advances numerous resilience projects, progress is constrained by fragmented, one-time, or short-term funding streams that are not aligned with the scale of climate-driven risks. Many adaptation and restoration efforts rely on competitive grants or temporary appropriations, making long-term planning difficult and leaving significant gaps for communities with limited capacity to pursue funding. Recent analyses indicate that achieving meaningful risk reduction will require consistent, reliable statewide investment on the order of hundreds of millions of dollars annually to strengthen infrastructure, natural systems, and community preparedness. Additionally, communities and responding agencies often face uncertainty about roles and responsibilities before, during, and after emergencies. Therefore, ensuring sustained and coordinated financing as well as clear, coordinated pathways for decision-making, resource deployment, and communication across state, county, and community organizations is essential to protect Hawai‘i’s residents, economy, and natural resources.

Conclusion

Hawai‘i stands at a pivotal moment as climate change accelerates risks across the islands. More intense storms, heavier downpours, longer droughts, expanding wildfire hazards, extreme heat, and rising seas are already reshaping the physical landscape and affecting daily life. These changes threaten infrastructure, natural resources, cultural sites, and community wellbeing, placing disproportionate burdens on residents with the fewest resources to prepare or recover.

Yet Hawai‘i also has a unique opportunity to lead with innovation, cultural grounding, and community partnership. By strengthening homes and neighborhoods, modernizing infrastructure, restoring natural systems, expanding resilience hubs, and aligning governance and funding structures, the State can dramatically reduce losses and improve long-term stability. Integrating traditional ecological knowledge, supporting community-led adaptation, and prioritizing equity ensures that resilience efforts uplift those most at risk.

A coordinated approach anchored by multijurisdictional agencies, informed by data, and grounded in local communities provides a path toward a safer, more stable future. With clear milestones, sustained investment, and transparent tracking of results, Hawai‘i can bend the risk curve, safeguard cultural lifeways, and ensure that future generations inherit a resilient, thriving island home.

The image shows a construction site at sunset. Two workers in hard hats are silhouetted against the bright orange and yellow sky. They are standing on a complex network of steel rebar and scaffolding. The sky is filled with soft, wispy clouds. The overall scene is one of active construction during the 'golden hour' of the day.

18. Workforce Planning Analysis

Implementation of this CAP will create high-quality jobs for Hawai‘i. Workforce development will be a critical component of ensuring that jobs are provided to kama‘āina. Developing a skilled workforce at home will allow the State to meet our climate goals and can also create pathways to sustainable careers for residents across the islands. This workforce should be developed in an equitable and inclusive manner and address barriers to accessing workforce opportunities for disadvantaged communities. This section details strategies and commitments to strengthen workforce partnerships, address anticipated labor changes, build sector-specific technical skills, overcome equity challenges, and ensure targeted funding and effective messaging.

In terms of employment opportunities, transitioning to a low-carbon economy is expected to have four categories of impacts on labor markets:

1. **Job Creation.** - New jobs will be generated in expanding sectors such as renewable energy, electric vehicles, resilient infrastructure, regenerative agriculture, ecosystem restoration, community resilience, etc.
2. **Job Transformations or Upgrades.** - Many existing occupations will be redefined as technologies, codes, and practices evolve. Workers will require new competencies through upskilling, credentialing, or reskilling to meet new climate and energy standards.
3. **Job Phase Out.** - Some jobs will decline or disappear entirely as fossil-intensive systems are replaced, outdated infrastructure is retired, or certain functions become automated.
4. **Jobs Indirectly Impacted.** - A wide range of occupations outside of “green sectors” will experience secondary effects as supply chains shift, procurement requirements change, and priorities shift toward low-carbon systems.

18.1 Workforce Partnerships

Hawai‘i’s existing workforce partnerships provide a strong platform for future growth but require expanded coordination and support across sectors and parties to meet the demands of our future climate-ready workforces. A number of agencies across the state are already active in workforce development and may serve as valuable collaborators in these efforts. The following is a list of some key organizations currently involved in this space:

Nonprofit Organizations:

- Affordable Hawai‘i Foundation
- Aloha ‘Āina Economic Futures (AAEF)
- Alu Like, Inc.
- American Job Centers
 - Workforce Innovation and Opportunities Act (WIOA)
- Chamber of Commerce Hawai‘i
 - Education & Workforce Development Team
 - Engineering Sector Partnership
 - Future of Work Annual Conference
 - Healthcare Sector Partnership
 - Kama‘āina Come Home Initiative
 - Technology Sector Partnership
- Council for Native Hawaiian Advancement (CNHA)
 - Hawaiian Trades Academy
 - Kāko‘o Maui Workforce Development Program
- Elemental Impact
- ‘Ewalu Industries
 - CREATE Hawai‘i
 - Lead for Hawai‘i Fellowship
 - ‘Ōpio Internship Program

- Workforce Advancement Initiative (WAI)
- Hawai‘i Conservation Alliance
- Hawai‘i Farmers Union United
 - Farm Apprentice Mentoring Program
- Hawai‘i International Science Experience
- Hawai‘i Workforce Funders Collaborative
 - Hawai‘i Worker Equity Lab
- Hawai‘i Workforce Pipeline
 - Career and Technical Education (CTE) Work-Based Learning: Networking & Showcase Conference
- Jobs for the Future
- Kaua‘i Economic Development Board
 - Academies of Kaua‘i
- Kupu
 - Conservation Leadership Development Program (CLDP)
 - Kupu ‘Āina Corps
 - Kupu Community Program
 - Natural Resources Sector Partnership
- Maui Economic Opportunities
 - Business Development Center
 - Community Services Department
 - Transportation Department
 - Youth Services Department
- Paepae o He‘eia
 - Ma Ka Hana Ka ‘Ike and Ku Hou Kuapa internships
- Purple Mai‘a
 - Hiapo Workforce Development
 - Mālama Design Studio
 - Pākōlea Small Business Pilot Program
- Vibrant Hawai‘i
 - ‘Iliahikū Work-Based Learning Initiative
 - KōCreate Initiative
 - Kuhikuhi Work-Based Learning Program
- Wastewater Alternatives and Innovations (WAI)
 - Work-4-Water Program

Public Agencies:

- County Economic Development Boards
- Department of Business, Economic Development & Tourism (DBEDT)
 - Creative Industries Division
 - Creative Industries Sector Partnership
 - Hawai‘i State Energy Office (HSEO)
 - Clean Energy Wayfinders
 - Clean Energy Sector Partnership
- Department of Education (DOE):
 - Career and Technical Education (CTE) Pathways

- Workforce Development Branch
- Department of Labor and Industrial Relations (DLIR)
 - Hawai‘i Green Jobs Initiative
 - Workforce Development Council (WDC)
 - Workforce Synergy Summit
 - Workforce Development Division (WDD)
 - Hele Imua Internship
- Department of Land and Natural Resources
 - Green Jobs Youth Corps
- Natural Energy Laboratory of Hawai‘i Authority (NELHA)
 - Hawai‘i Ocean Science and Technology (HOST) Park
 - NELHA Internship Program

Academic Institutions:

- College of Tropical Agriculture and Human Resources (CTAHR)
- GoFarm Hawai‘i
- Kamehameha Schools
- National Disaster Preparedness Training Center (NDTPC)
- Pacific Internship Programs for Exploring Science (PIPES)
- University of Hawai‘i and Community Colleges
- UH Foundation
- University of Hawai‘i Sea Grant
 - Aquaculture Sector Partnership

Partnerships:

- Hawai‘i P-20
 - Education Data Initiative
 - GEAR UP Hawai‘i
 - Hawai‘i Graduates for Hawai‘i’s Future
 - Hawai‘i P-3 Initiative
 - Ke Ala Na‘auao
- Good Jobs Hawai‘i

Private Sector:

- AE Consulting
 - Sector Partnerships Support
- Harold K.L. Castle Foundation
 - Hawai‘i Youth Apprenticeship Network (HYAN)
- Hawai‘i Community Foundation
 - ALICE Initiative Cohort
 - House Maui Initiative
 - Social Impact Investment Fund
 - THINK Fund
- Ma‘o Farms
 - Farm Expansion Experience (FE‘E)

Skilled Trades and Technical Training Partners:

- Hawai‘i Carpenters Apprenticeship and Training Fund (HCATF)
- Hawai‘i Operating Engineers Local 3 Training Center
- IBEW Local 1186 (International Brotherhood of Electrical Workers)
- Painters and Allied Trades (IUPAT District Council 50)
- Plumbers & Fitters UA Local 675

This diverse ecosystem of partners across the state including public agencies, nonprofits, educational institutions, and industry leaders is actively contributing to Hawai‘i’s workforce development landscape. State agencies such as the Department of Labor and Industrial Relations (DLIR), the Department of Education (DOE), and the Department of Business, Economic Development & Tourism (DBEDT) are playing a growing role in shaping a more coordinated and climate-responsive workforce development system. DLIR advances workforce readiness through initiatives like the Workforce Development Council and the Hawai‘i Green Jobs Initiative, which identifies employment opportunities in renewable energy, conservation, and other sustainability-related fields while aligning labor market data with education and training systems. DOE contributes through its Career and Technical Education (CTE) pathways in areas like clean energy, STEM, and sustainable agriculture, and oversees a Workforce Development Branch that supports career readiness throughout the K–12 system. However, capacity remains limited, and additional resources are needed to strengthen climate-related offerings. DBEDT contributes through its leadership in innovation and economic development, including efforts led by the Hawai‘i State Energy Office (HSEO) such as the Clean Energy Wayfinders and the Clean Energy Sector Partnership, which aim to improve energy equity and access in vulnerable communities and build a local, skilled talent pipeline for Hawaii’s clean energy sector.

A key strategy for cross-sector coordination is the use of industry-specific sector partnerships. Funded by DLIR and convened by the Chamber of Commerce Hawai‘i, with logistical support from AE Consulting, these partnerships bring together employers, educators, and workforce organizations to identify shared needs and co-design training programs. Active sector partnerships in industries such as healthcare, clean energy, technology, engineering, aquaculture, and the creative economy are aligning education with real workforce demand and building shared goals for recruitment, training, and job placement. For example, the Engineering and Technology Sector Partnerships facilitate collaboration between employers and educators to ensure curriculum reflects current industry needs.

The Natural Energy Laboratory of Hawai‘i Authority (NELHA) also supports green workforce development through its work in aquaculture, clean energy, and sustainable technology sectors. Through its HOST Park and partnership initiatives, NELHA offers hands-on training, internships, and career pathways for local residents in emerging green industries.

As a participant in the U.S. Climate Alliance’s Climate-Ready Workforce Initiative, the State is contributing to a national effort to accelerate the development of a diverse, equitable, and inclusive climate-ready workforce, with a particular focus on establishing new climate-ready pre-apprenticeship and Registered Apprenticeship programs. This initiative supports the creation of new pathways into good-paying, high-quality jobs in climate mitigation, adaptation, and resilience,

particularly for workers from underrepresented communities. More information about the initiative is available at www.usclimatealliance.org

Alongside state agencies, nonprofits and community-based organizations are advancing innovative models rooted in local knowledge and cultural grounding. Organizations such as ‘Ewalu Industries, Kupu, Purple Mai‘a, Work-4-Water, and Vibrant Hawai‘i that offer strong models for career exposure, work-based learning, and leadership development. Their initiatives exemplify values-driven, community-rooted workforce development aligned with climate resilience. ‘Ewalu Industries operates four integrated programs, CREATE Hawai‘i, the Lead for Hawai‘i Fellowship, the ‘Ōpio Internship Program, and the Workforce Advancement Initiative (WAI), that provide hands-on learning, paid fellowships, and employer engagement strategies. The Council for Native Hawaiian Advancement (CNHA) advances workforce development through initiatives like the Hawaiian Trades Academy, which offers training programs in skilled trades such as construction, CDL licensing, and clean energy, with a focus on uplifting Native Hawaiian and underserved communities. Additionally, CNHA’s Kāko‘o Maui initiative supports economic recovery and resilience on Maui by funding job training, small business support, and employment opportunities in response to recent disasters, helping to build long-term community capacity and workforce readiness.

The Hawai‘i Workforce Funders Collaborative (HFWC) is a non-profit that brings together philanthropy, government, education, business, and nonprofit leaders to strengthen workforce systems across the state. HFWC focuses on aligning investments, coordinating strategies, and scaling high-impact solutions that connect residents to quality jobs and economic mobility. As part of this work, HFWC launched the Hawai‘i Worker Equity Lab to help ensure that equity remains central to workforce planning. The Lab addresses systemic barriers faced by marginalized communities including Native Hawaiians, immigrants, and low-income workers through policy research, advocacy, and coalition-building. Together, these efforts help expand access to quality jobs, elevate worker voices, and promote economic security rooted in justice and community empowerment.

The ‘Āina Aloha Economic Futures (AAEF) framework is a Native Hawaiian-led vision for a just and sustainable economy in Hawai‘i that centers the values of kuleana (responsibility), mālama ‘āina (care for the land), and collective well-being. Developed through broad-based community engagement, AAEF calls for a shift away from extractive and externally dependent economic models, and toward locally grounded systems that restore and sustain ‘āina, uplift Indigenous knowledge, and promote self-determination.²⁴⁴ In the context of workforce development, this means investing in career pathways that are not only economically productive, but that also reinforce cultural identity, foster environmental stewardship, and serve community-defined goals. The AAEF framework supports the growth of industries aligned with regenerative practices such as sustainable agriculture, renewable energy, and ecosystem restoration, creating opportunities for kama‘āina to thrive in fields that are rooted in place, resilience, and long-term community wellbeing. This approach is particularly well-suited to climate workforce development, which by nature requires solutions that are locally appropriate, ecologically sound, and socially just. To support implementation, AAEF developed the ‘Āina Aloha Assessment Tool, a values-based rubric that can be used to evaluate policies, programs, and public investments, including workforce initiatives and RFPs. Integrating this tool into workforce planning processes can help ensure that

investments align with community priorities and advance culturally grounded, regenerative economic pathways.

There is a clear need in workforce development initiatives for collaboration across public, private, nonprofit, labor, and educational entities, as well as across industry sectors. Programs are often fragmented across islands and lack coordination. There is a need for stakeholders to convene regularly, align efforts, and reduce duplication by sharing best practices and centering shared goals. Intermediary organizations that help coordinate across institutions and sectors can play a key role in matching training curricula to real hiring needs, facilitating partnerships, and ensuring that support services are integrated across systems. An example of this coordination is the Hawai‘i Workforce Pipeline which functions as an intermediary connecting educators and employers to coordinate project-based learning and work-based experiences. Their model streamlines employer engagement while expanding real-world career exposure for students. These cross-sector collaborations are especially important for developing inclusive pathways for underrepresented populations and scaling up sector-specific solutions. Another strategy to cross-sector collaboration is to codify a unified state workforce strategy and set a “North Star” goal for shared metrics and accountability.²⁴⁵

18.2 Anticipated Labor Changes

Investments in GHG emission reduction measures represent opportunities for existing and new businesses in Hawai‘i. These include businesses directly implementing elements of the measures, such as contractors, HVAC suppliers, construction companies, appliance manufacturers, renewable energy developers, car dealerships, arborists and bike shops, as well as businesses supporting them, such as banks and credit unions, engineering firms, architects and designers, and insurance companies. According to a 2022 study by the National Renewable Energy Laboratory (NREL), significant increases in employment are expected in solar PV, battery storage, and wind energy installation by 2030.²⁴⁶ As Hawai‘i moves towards a climate-resilient economy, workforce demands will shift dramatically. Policy and implementation design can maximize the benefits of new job creation during the implementation of low-carbon measures while also mitigating the negative effects of job losses in certain sectors. As industries that are gradually phased out leave some workers vulnerable, tools and resources can be provided to help with the transition into high-quality jobs. This support could take the form of financial assistance, targeted workforce training, and economic development initiatives to foster resilience. Job growth is anticipated in sectors such as:

- Regenerative agriculture and aquaculture
- Renewable energy
- Energy-efficient and climate-resilient building construction and retrofits
- Disaster preparedness and resilience
- Land management
- Coastal zone management
- Ocean resource management
- Clean transportation
- Clean water
- Waste management, composting and recycling.
- Data science, climate modeling, and GIS technology applications.

- Public health related to climate impacts

To effectively prepare for projected job growth in these sectors, Hawai‘i must identify training pipeline deficiencies and map existing workforce pathways. These analyses should emphasize outcomes for historically underrepresented populations, including efforts to retain local talent and support the return of kama‘āina and Native Hawaiians who wish to come home. They should also be informed by meaningful engagement with those actively developing and implementing workforce strategies. With additional resources, DLIR is well-positioned to lead these efforts in partnership with sectoral experts, educational institutions, and third-party consultants with experience in climate workforce planning.

These sectors will require workers with specialized technical skills and certifications. Reskilling and lifelong learning must be supported through stackable credentials, microcredentials, and technology-driven training programs. Increasing involvement in the Eligible Training Provider List will also be an important strategy.²⁴⁷ This program enables workforce training programs in Hawai‘i to be funded through the Workforce Innovation and Opportunity program.

18.3 Sector-Specific Technical Skills for a Climate-Ready Workforce

To effectively implement the climate measures identified in this plan, Hawai‘i must invest in developing a workforce with the technical skills necessary to meet sector-specific demands. These technical skills form the foundation for building Hawai‘i’s climate-resilient workforce. Each sector offers an opportunity to align job training programs, certifications, and educational pathways with the growing demand for climate-related services. By developing targeted curricula, expanding hands-on training opportunities, and connecting learners to career pathways in these fields, Hawai‘i can grow a workforce that is both capable and reflective of the meeting state’s goals for a climate resilient future.

Hawai‘i must also strengthen training pipelines that prepare workers for hazard-specific mitigation and rapid response in the face of increasing climate impacts. Communities highlighted the need for locally based teams trained in wildfire fuel reduction, invasive grass removal, hazardous tree mitigation, drainage and culvert clearing, debris management, and post-disaster damage assessments. Building pathways for storm-resilient construction, floodproofing, drought-adapted water management, coastal monitoring, and nature-based shoreline protection can further improve community safety and accelerate recovery.

The following outlines the foundational skillsets required across key sectors driving the state’s climate action efforts.

Agriculture:

- Sustainable crop production (e.g., agroforestry, regenerative agriculture)
- Soil health monitoring and amendment
- Pest and nutrient management with reduced chemical inputs
- Drip irrigation and water efficiency technologies
- Climate-smart farm planning and risk assessment

- Agricultural drone use and remote sensing

Aquaculture:

- Hatchery operations and aquatic animal husbandry
- Water quality monitoring and testing
- Native species restoration
- Integrated multi-trophic aquaculture systems
- Disease prevention and biosecurity
- Marine aquaculture infrastructure maintenance

Clean Energy:

- Solar PV system design, installation, and maintenance
- Battery storage technology installation and integration
- Grid modernization and smart grid deployment
- Wind turbine operation and maintenance
- Energy system modeling and forecasting
- Compliance with safety and renewable energy codes

Clean Transportation:

- Electric vehicle (EV) charging infrastructure installation
- EV repair and diagnostics
- Transit system electrification planning
- Micromobility deployment and maintenance
- Traffic data analysis and smart mobility tech
- Active transportation design (e.g., bike/pedestrian infrastructure)

Clean Water:

- Drinking water treatment and distribution systems
- Wastewater management and decentralized systems
- Stormwater catchment and green infrastructure
- Leak detection and water conservation technologies
- Hydrological modeling and groundwater management
- Regulatory compliance for water quality standards

Coastal Zone Management:

- Shoreline erosion monitoring and modeling
- Nature-based solution design (e.g., living shorelines)
- Coastal infrastructure planning and permitting
- Climate risk assessment and adaptation planning
- GIS and remote sensing for coastal resilience
- Stakeholder engagement and community-based planning

Data Sciences:

- Climate modeling and scenario planning
- Geographic Information Systems (GIS)

- Environmental sensor calibration and maintenance
- Programming languages for analysis (e.g., Python, R)
- Data visualization and dashboard design
- Integration of socio-environmental datasets

Disaster Preparedness and Resilience:

- Community-based risk assessment and early warning systems
- Emergency operations planning, Incident Command System training
- Multilingual hazard communication and neighborhood resilience coordination
- Hazard mitigation, resilient retrofit techniques, and storm-resistant construction
- Shelter operations, mass care, and evacuation readiness
- Wildfire fuel reduction, invasive grass and hazardous tree management
- Shoreline monitoring and nature-based coastal resilience (e.g., dunes, wetlands)
- Flood prevention and drainage/culvert maintenance
- Post-disaster assessments, debris management, and emergency cleanup

Energy Efficient and Climate Resilient Buildings:

- Building energy audits and thermal envelope assessments
- HVAC and ventilation system retrofits
- Passive cooling and green design strategies
- Building electrification and heat pump installation
- Use of low-carbon and recycled construction materials
- Resilient siting and flood-proof construction practices

Land Management:

- GIS mapping and land use analysis
- Forest restoration and native plant propagation
- Invasive species identification, detection, management and removal
- Prescribed fire planning and implementation
- Conservation planning and carbon sequestration estimation
- Monitoring of ecosystem services and soil erosion

Ocean Resources:

- Marine spatial planning
- Coral reef monitoring and restoration
- Fisheries management and stock assessment
- Marine protected area enforcement
- Ocean acidification impact monitoring
- Underwater ROVs and ocean data instrumentation

Public Health:

- Vector-borne disease surveillance and prevention
- Heat stress monitoring and response
- Air quality data interpretation
- Public health emergency planning
- Environmental health and climate communication

- Health impact assessments for infrastructure and land use projects

Waste Management and Circular Economy:

- Deconstruction and materials salvage
- Composting, organic waste treatment, and anaerobic digestion
- Recycling stream sorting and quality control
- Hazardous and e-waste handling and disposal
- Lifecycle analysis and waste audits
- Repair and remanufacturing technologies

18.4 Strengths, Risks, and Opportunities

One example of scalable education-industry collaborations is the earn-and-learn model, where workers can participate in online and in-person training to earn credentials and advance their careers while remaining employed. Employers can allow for adjustments in work schedules to accommodate training hours and may also provide supplemental pay. These models are especially critical for adult learners, incumbent workers, and individuals without the means to pursue unpaid training or full-time study. They allow individuals to gain industry-relevant skills while earning income, reducing financial barriers and enhancing retention. A strong example of earn-and-learn collaboration is the Healthcare Association of Hawai‘i’s CNA to LPN Glidepath program, which combines online instruction with hands-on clinical training through a partnership between UH Community Colleges, local employers, and labor organizations. This type of employer-aligned, applied learning model could be replicated in clean energy, climate resilience, conservation, or emergency response fields where hands-on skills are equally critical.

Many climate-related careers lack clear, structured educational pathways, particularly at the 2-year college level, which creates major gaps in awareness, access, and affordability. Emerging fields like climate resilience, energy systems, sustainability science, and waste management often don’t have associate degrees or stackable credentials that serve as on-ramps to long-term careers. A lack of stackable credentials and alignment across training programs and sectors is a significant barrier to creating the long-term pools of skilled workers needed to implement climate goals. Students and workers often face dead-ends when attempting to transition between educational institutions or career advancement pathways. This absence disproportionately affects students from underrepresented and resource-constrained backgrounds, who rely on affordable entry points and visible outcomes to guide their education decisions. Without a statewide framework that ensures alignment and stackability of credentials, apprenticeships, and training experiences, Hawai‘i may fail to create a sustainable workforce pipeline that can meet the demands of the future.

The new ASNS–Natural Resources and Environmental Management (NREM) program launching in the 2025–2026 academic year exemplifies how these gaps can be addressed. Developed by Kapi‘olani and Windward Community Colleges in partnership with UH Mānoa, KUPU, Hawai‘i P-20, and community leaders, this program offers a direct transfer route into UH Mānoa’s NREM bachelor's degree. It also raises awareness of natural resource careers through early exposure and structured guidance. This structure and the process for creating it could be replicated in other climate-relevant areas such as renewable energy, circular economy, or environmental health, helping build a more inclusive and robust local workforce.

Another pressing issue in Hawai‘i is workforce retention. Hawai‘i’s high cost of living and lack of affordable housing result in skilled workers leaving the state. Hawai‘i already faces shortages of workers essential to a climate-ready workforce such as bus drivers, mechanics, solar installers, and local engineers, and stakeholders emphasize that it is not enough to simply train more workers in these fields, affordability also needs to be addressed. Despite considerable investment in educational and training programs, many residents leave the state to seek affordable living elsewhere, undercutting the return on investment in local workforce development. Addressing this challenge requires not only reducing the cost of housing but also ensuring that climate-related careers offer livable wages that reflect the realities of Hawai‘i’s economy. This can be supported through policies such as prevailing wage standards, wage subsidy programs tied to apprenticeship models, and leveraging public procurement to reward employers who commit to fair compensation in climate-critical sectors. Providing robust wraparound services is essential to supporting retention and success. These services include childcare, transportation subsidies, stipends or paid training models, language translation and tutoring, mental health counseling, and reentry support for justice-involved individuals. Partners for these services extend beyond traditional social-service organizations and can include local nonprofits, health centers, county economic opportunity councils, apprenticeship programs, skilled-trades training centers, community colleges, unions, and education providers that offer the classes and certifications needed for climate-aligned careers.

Programs that support a transition home for local residents that are pursuing careers on the continental U.S. may help alleviate this issue. The Kama‘āina Come Home initiative offers a compelling model in the engineering sector. A partnership between the Chamber of Commerce Hawai‘i and the Hawai‘i Island Economic Development Board, this program provides returning residents with one-on-one mentorship from local engineering executives, curated job leads, and access to networking events. It makes the return home more accessible, while spotlighting in-demand career opportunities in Hawai‘i. Similar return pathways could be developed for climate-aligned careers such as environmental planning, energy efficiency, or green infrastructure, helping to reverse brain drain and ensure training investments serve Hawai‘i’s communities.

The conservation and natural resource management sector faces particularly severe wage and retention challenges. Although this work is foundational to Hawai‘i’s long-term climate resilience and the health of our natural systems, conservation positions remain chronically underfunded and often pay far below a livable wage. A major barrier to securing stronger investment is that the benefits of conservation, as well as the costs of underinvestment, often unfold over decades. Because these impacts are not immediately visible, they are too often perceived as less urgent or less pressing than other budget priorities, making it harder to build public and political support for raising wages in this field. At the same time, many entry-level conservation jobs unnecessarily require a college degree, creating an additional barrier for local workers and limiting access to career pathways that could otherwise support more residents. Adjusting qualification requirements and expanding skills-based hiring would open doors to a broader and more diverse workforce. To shift these dynamics, Hawai‘i must more clearly communicate and celebrate the measurable successes of well-funded conservation efforts, highlighting how early investment prevents much

higher long-term costs and strengthens support for livable wages and accessible career pathways in this climate-critical sector.

There is also a need to expand CTE and higher education programs that are aligned with real-world climate resilience projects. Only a small number of DOE high schools offer CTE pathways in climate-related pathways. Expanding climate-related CTE pathways could significantly increase student awareness of emerging career opportunities and inspire early interest in sectors critical to Hawai‘i’s climate resilience. Moreover, these pathways can help close equity gaps by providing practical, affordable entry points into sustainable careers, especially for students from underrepresented and resource-constrained backgrounds. Climate education must also evolve beyond traditional classroom-based instruction to emphasize experiential and place-based learning that builds the practical skillsets residents will need for climate resilience. Integrating ‘āina stewardship, community science, and hands-on climate monitoring into curricula can help develop “citizen scientists” who are equipped to understand local climate impacts, participate in resilience efforts, and contribute to community-level data collection and decision-making. Strengthening these connections between students, teachers, and ‘āina helps ensure that climate learning is culturally grounded, community-serving, and aligned with the long-term needs of Hawai‘i’s climate-resilient future. Intermediary organizations can help align curricula with industry needs, coordinate work-based learning placements, facilitate wraparound services, and monitor employment outcomes across systems. Intermediary organizations may include workforce nonprofits, sector-based partnerships, workforce development boards, or regional economic collaboratives that serve to bridge the gap between training providers and employers.

Expanding Work-Based Learning (WBL) programs will offer students direct exposure to climate resilience careers and build stronger employment pipelines. If WBL efforts focus particularly on rural, underserved, or marginalized communities, where access to career-connected learning is often limited, they can help retain local talent and allow kama‘āina to pursue fulfilling careers without leaving the islands. There is also a need to need to strengthen career navigation supports, including peer mentorship, comprehensive career counseling, labor market data tools, and community-embedded navigators who can help individuals move through education and employment transitions. These services are especially important for learners from underrepresented backgrounds, who may face added barriers to navigating the workforce.

Another promising opportunity lies in deepening climate-ready career integration across Hawai‘i P-20’s Education to Career Pathways Alignment initiative. The existing pathway maps already span a wide range of industries, including construction, healthcare, information technology, and agriculture, many of which are deeply affected by climate change. However, climate career connections are not consistently emphasized within these pathways. A coordinated effort to identify and embed climate-resilient roles within each sector, such as clean building design in construction, disaster readiness in public health, or sustainable IT infrastructure, could greatly increase awareness and uptake of climate-aligned careers by youth across the state. This would not require creating new pathways, but rather, leveraging and enhancing the relevance of existing ones. Doing so would ensure students see their own interests and talents reflected in Hawai‘i’s climate future, regardless of sector.

Expanding early exposure to technical careers is critical for ensuring equitable access and building future workforce capacity. Pre-apprenticeship models are particularly effective for engaging

disconnected youth, low-income students, and others who may not see themselves represented in traditional workforce pipelines. These programs often include stipends, mentorship, dual credit options, and soft skills training to help young people transition successfully into Registered Apprenticeship Programs (RAPs) or college. RAPs provide structured, paid, on-the-job training combined with classroom instruction, leading directly to industry-recognized credentials and stable employment. To expand these opportunities, Hawai‘i could prioritize funding, streamline employer engagement to develop new apprenticeship positions, and strengthen the connection between pre-apprenticeships and RAPs through formal partnerships, ensuring seamless transitions and clear career pathways for participants.

The Hawai‘i Youth Apprenticeship Network (HYAN), supported by the Harold K.L. Castle Foundation and guided by Jobs for the Future, is a leading example. This initiative focuses on designing equitable, place-based apprenticeship readiness pathways for youth aged 16–24. It emphasizes community partnerships, regional implementation, and barrier-reducing supports such as wraparound services and dual enrollment. A climate-focused version of this model could include placements in green construction, conservation, or solar installation, and would be especially impactful in rural communities where opportunity gaps are widest.

In addition to investing in workforce training streamlining business regulations will make it easier for new industries to grow and thrive. Many stakeholders have emphasized that without expanding local industries beyond tourism and hospitality, job creation will remain limited regardless of how well-prepared the workforce is. Building a climate-ready workforce must go hand in hand with growing the sectors that can actually absorb and retain that talent. In addition to regulatory streamlining reduced procurement and qualification barriers will support local contractors in competing for climate-related contracts. Many climate-critical sectors require technical qualifications or bonding levels that are difficult for small or emerging local firms to meet. Strengthening technical assistance, expanding access to required certifications, and aligning procurement criteria with local capacity can help ensure that Hawai‘i-based contractors are able to participate in and benefit from the transition to a climate-resilient economy. For example, currently a significant portion of revenue from geothermal development flows to entities outside of Hawai‘i. Ensuring that local communities share in the economic gains requires both reducing barriers for local contractors to participate in geothermal-related work and tying geothermal development to community benefits packages. These packages can help ensure that revenue, workforce opportunities, and resources are reinvested in communities that host geothermal infrastructure, advancing both economic equity and community trust.

18.5 Equity and Underserved Communities

Increasing access within Title I schools can help close long-standing opportunity gaps and ensure that the next generation of climate leaders reflects the diversity of Hawai‘i’s communities. Title I schools where students often have fewer opportunities for exposure to climate science, clean energy, natural resource management, and related careers can benefit from expanded climate-related curriculum, hands-on learning experiences, and career-connected programs. These programs are essential to ensuring that students from underserved communities are not left behind in Hawai‘i’s transition to a climate-resilient economy.

Another barrier to equitable access is the limited availability of alternative education pathways for students who do not thrive in traditional school environments. Many young people disengage not because of lack of potential, but because conventional models do not reflect their cultural background, learning style, or life circumstances. Alternative programs can provide culturally grounded instruction, hands-on learning, and personalized support that help students reconnect to their identity, earn a diploma, and gain the skills necessary to enter entry-level green jobs and other climate-aligned careers.

However, these programs are significantly constrained because DOE funding does not currently follow students who transition out of traditional schools. Adjusting policies so that resources follow the learner would enable community-based and culturally grounded alternative programs to expand, improve quality, and serve more students who need different pathways to success. It would also create incentives for schools to better support students at risk of disengaging, rather than losing them and the associated funding to other programs.

A promising model that could be scaled statewide is the Kupu Community Program, which provides paid work experience, wraparound support, ‘āina-based learning, and pathways to both high school completion and entry-level green jobs. This program demonstrates how alternative, community-driven education can reconnect youth with their culture, build confidence and purpose, and prepare them for meaningful participation in Hawai‘i’s climate workforce. Scaling similar models combined with funding that follows the student could dramatically expand equitable access to climate-aligned careers for youth who have been historically underserved by traditional systems.

Formerly incarcerated individuals face unique barriers to employment and economic stability, making them a key population to support through equitable workforce development strategies. The nonprofit Men of PA‘A offers a valuable example of how restorative justice and ‘āina-based programs can be integrated to provide job training, skill development, and meaningful employment opportunities for individuals transitioning out of the criminal justice system. Their model, which combines emotional healing with practical workforce readiness, represents a community-centered approach that could be scaled statewide to create inclusive pathways to economic opportunity and reduce recidivism. Events like the 2024 Chaminade University symposium, “Pathways to Meaningful Work: A Justice-Involved Symposium,” highlight the importance of statewide collaboration in addressing these barriers and advancing policies, partnerships, and investments to support reentry success. Nationally, initiatives like Jobs for the Future’s Center for Justice & Economic Advancement provide a framework for removing systemic barriers and connecting people with criminal records to quality education and employment, offering models that Hawai‘i can learn from and adapt to local needs.

18.6 Messaging Opportunities

Effective messaging can build broader support for climate workforce initiatives. Climate careers positioned not just as good jobs, but as meaningful, resilient careers tied to the stewardship of Hawai‘i’s land, waters, and people will expand the public’s understanding of what a “climate career” can look like. Many people assume these jobs are limited to clean energy or transportation sectors, but climate resilience requires a far more diverse range of skills and professions—

including data science, GIS, communications, business development, construction, public health, arts and culture, and nonprofit management. Individuals from nearly every background and training can play a meaningful role in climate solutions. Messaging must be creative, inclusive, and specific—showcasing diverse real-life examples and emphasizing that climate work is interdisciplinary, accessible, and deeply connected to place. Stories of young people finding purpose and belonging through work that aligns with their values and serves their community can be especially compelling and can inspire a new generation. Messaging should also tie workforce development to pressing community needs like food security, energy affordability, and disaster resilience.

Messaging can also play a role in driving cohesion. A scattered and siloed approach dilutes the impact of each investment and creates confusion among both providers and participants. Messaging should encourage alignment across agencies and highlight the need to invest in strategic systems change. One successful example of a unified messaging and action strategy is the effort by the Hawai‘i Workforce Development Council, which convened a broad coalition of stakeholders, including the Department of Education, University of Hawai‘i, state agencies, private businesses, and county governments, to come together behind a single unified state workforce plan with support from the National Governors Association. This effort resulted in agreement on a small set of strategic actions that each partner could contribute to in different ways. Elevating this type of model through messaging and public storytelling reinforces the value of collaboration and shared accountability.

18.7 Recommendations

The following measures address the opportunities and challenges detailed in this chapter. They build on existing efforts while improving coordination between programs, making it easier for people to access opportunities, and help more residents successfully train for and enter climate-related careers. These recommendations can equip the state with the tools needed to prepare a climate-ready workforce, remove participation barriers for underserved communities, and retain local talent for the long term.

Support and Scale Intermediary Organizations and Employer Partnerships for Work-Based Learning

Strengthen the ecosystem of organizations that serve as intermediaries between educational institutions and employers to facilitate work-based learning opportunities. These organizations play an essential role in aligning curricula with real workforce needs, arranging pre-apprenticeship and apprenticeship placements, and supporting students, educators, and employers throughout the training-to-employment pipeline. While creating new programs is one option, the state can also provide flexible, sustained support to existing intermediaries to scale their efforts and coordinate across islands and sectors. This could include public–nonprofit partnerships and technical assistance for smaller community-based organizations that are already connecting learners to job opportunities. One key role these intermediaries can play is helping education and training providers stay aligned with actual employer needs, by coordinating outreach, sharing information about upcoming hiring needs, and making sure that students in training programs are being prepared for real jobs in their region.

Intermediaries can also take on the logistical and administrative responsibilities that often make work-based learning difficult for schools and employers to manage on their own. This includes designing and planning programs, developing curriculum in collaboration with employers, coordinating student schedules, onboarding participants, tracking outcomes, and providing support throughout the placement. By handling these functions, intermediaries reduce the burden on teachers and businesses, making it more likely that meaningful and equitable work-based learning partnerships can be sustained over time. ‘Ewalu Industries and the Hawai‘i Workforce Pipeline are two examples of existing organizations that fulfill such a role.

Partnerships with large employers such as public utilities, water agencies, and clean energy companies are especially valuable in this effort. These employers can serve as anchor sites for training programs by providing access to real-world facilities, mentorship, and long-term job opportunities. In rural areas or underserved communities, they can also offer land, infrastructure, or project sites that make place-based learning possible.

Develop a Statewide Framework for Stackable Climate Credentials

A credential system made up of smaller, skill-specific courses or certifications that can be combined over time can ensure learners can advance from entry-level training to long-term careers. This framework should begin by identifying key climate sectors with the greatest workforce demand and clarifying the skills and competencies needed in those fields through consultation with employers, educators, and workforce experts.

Credential pathways should include both credit-bearing and non-credit programs, enabling flexibility for diverse learners including high school students, community college enrollees, incumbent workers, and adults seeking to reskill. These smaller credentials must be intentionally designed to build on one another, allowing individuals to start with foundational training and continue adding skills as they advance into higher-level roles. To support this progression, the system should ensure clear connections between training programs, such as between DOE, UH Community Colleges, and UH Mānoa, and credentials should be recognized by employers as meaningful qualifications.

Where possible, credentials should align with national standards while also integrating Hawai‘i specific knowledge. This effort would also strengthen the connections between high school CTE programs, UH Community College degrees, and employment opportunities, ensuring that students can build on what they’ve already learned without losing credit or hitting dead ends as they move from education into the workforce.

Expand Work-Based Learning and Paid Apprenticeship Opportunities

Hawai‘i should expand paid, work-based learning opportunities in climate sectors through registered apprenticeships, pre-apprenticeship programs, and project-based learning aligned with DOE, university, and community college programs. These programs should include stipends, mentorship, and earn-and-learn flexibility for working learners. Employer participation can be encouraged through wage subsidies, flexible scheduling support, and intermediary-led facilitation. To support equity, programs should target youth, women, and rural communities.

The state should also help employers and community partners better understand and access existing federal workforce resources, such as those available through the American Job Centers

and the Workforce Innovation and Opportunity Act (WIOA). WIOA funding helps cover the cost of training for eligible individuals, particularly those facing barriers to employment, and includes wage reimbursement programs that incentivize employers to take on apprentices or trainees by reducing the financial risk of hiring someone new. Despite its potential, many employers are unaware these supports exist or don't know how to access them. Increasing awareness and simplifying access to these programs could significantly expand participation in work-based learning partnerships. At the state level, the Department of Labor and Industrial Relations (DLIR) should be resourced and empowered to play a stronger coordinating role across agencies, employers, and training providers to help align efforts, monitor outcomes, and sustain long-term strategy implementation.

Strengthen Climate Career Pathways and Early Exposure in Education

Coordination with DOE, UH, and partners in the Hawai'i P-20 system to integrate climate-aligned career content into K-12 and postsecondary pathways is needed. This includes expanding CTE programming in high schools to cover green careers; incorporating climate-related content into existing pathway maps such as healthcare, construction, and agriculture; and aligning classroom learning with hands-on experiences such as internships, project-based learning, and field-based courses. Place-based framing, such as the ahupua'a system, can help make climate topics more culturally relevant and meaningful for students. Concurrently, we must integrate practical climate literacy into the K-12 curriculum, specifically educating students through high school that heating and cooling loads are primary energy consumers in homes and demonstrating practical ways these loads can be reduced through efficiency and design.

Career exposure should begin early, ideally in middle school, to help students see the real-world value of green careers and build interest over time. Teacher externship opportunities should be expanded, as they help align classroom instruction with actual workforce needs by giving educators direct experience in the field. When teachers are familiar with the work, they're better able to spark curiosity and connect lessons to real job opportunities. These externships should be incentivized through professional development credits, stipends, or career advancement pathways. To support these efforts, the Department of Education should consider adding dedicated staff positions focused on green career pathway development and climate-aligned curriculum coordination across schools and CTE programs.

To ensure learners can make full use of these pathways, the state should also expand career navigation supports such as peer mentorship programs, school-to-career transition coaches, and community-based workforce navigators. These services help learners understand their options, make informed decisions, and access training and job opportunities. Navigation supports should be embedded in schools and other trusted community spaces such as resilience hubs, with a focus on reaching students and workers in rural areas, underserved communities, and those facing language or accessibility barriers.

Address Structural Barriers to Participation and Workforce Retention

Hawai'i's climate workforce strategy must explicitly address the structural barriers that keep residents from completing training or remaining in the state after receiving it. This includes supporting wraparound services such as childcare, transportation, mental health care, and food assistance. It also means expanding digital access for learners who depend on remote or hybrid instruction. Climate workforce investments must also be linked with broader efforts to address the

affordability crisis, including housing costs, cost of living, and economic insecurity. Otherwise, the state risks training a workforce that may ultimately move away due to affordability challenges. To support retention, climate-related jobs must offer livable wages that reflect Hawai‘i’s high cost of living. The State can support this through tools such as prevailing wage standards, wage subsidies tied to apprenticeship or earn-and-learn models, and public procurement policies that favor employers committed to fair compensation. These strategies can help ensure that public investment in climate workforce development leads to long-term, economically viable employment for local residents.

Integrate the ‘Āina Aloha Economic Futures Framework into Workforce Planning

As Hawai‘i’s progresses in expanding climate-aligned job training, it is important for workforce initiatives to be connected to the cultural values, lived experiences, and long-term visions of local communities. The ‘Āina Aloha Economic Futures (AAEF) framework helps achieve this by providing a community-informed approach to economic development that aligns with the goals of climate resilience and place-based stewardship.

Integrating AAEF into workforce planning can improve program design and increase retention by ensuring that training pathways resonate with local priorities and community-defined visions of well-being. This is especially important for engaging Native Hawaiian, rural, and youth participants who may be more motivated by opportunities that contribute to their communities and ‘āina. By grounding workforce planning in AAEF principles, the State can build pathways that are culturally relevant, support retention of kama‘āina talent, and strengthen community ownership over economic outcomes.

The AAEF Assessment Tool offers a practical mechanism for evaluating proposed workforce initiatives, funding strategies, and public–private partnerships through a values-based lens. Applying this tool to climate workforce initiatives can help ensure investments are responsive to local needs, advance equity, and reinforce a regenerative, place-based economy.

18.8 Workforce Funding Needs

Achieving a climate-ready and equitable workforce in Hawai‘i will require strategic and sustained investment by both the State and private sector. While much of this plan outlines systems and programs that should be scaled, it is important to recognize that funding is what enables those systems to function equitably and effectively. Investment is needed not only in technical training but also in the infrastructure, tools, and partnerships that support access, retention, and long-term success. This includes not only funding for education and infrastructure, but also addressing economic pressures, such as housing and wage instability, that undermine workforce retention.

Priority funding areas include:

- **Infrastructure for hands-on training**, such as physical training sites, mobile training units, and equipment required for learning in climate-critical fields.
- **Technology and digital access**, including broadband, devices, and software to support remote and hybrid training—especially important for rural and neighbor island communities.
- **Capacity building for community-based organizations (CBOs)** that already serve as trusted partners in delivering training and support services. Many of these

organizations need funding to expand staffing, manage grants, and sustain programming.

- **Seed funding for innovation**, including pilot programs that test new models of climate workforce development. These may include cross-sector approaches (e.g., climate and public health), community-led curricula grounded in local knowledge systems, or new circular economy training pathways. Innovation grants offer a low-risk way to evaluate promising models before scaling them and should prioritize equity, cultural relevance, and long-term employment outcomes.

By resourcing these foundational elements, the state can ensure that workforce initiatives outlined in this plan are not only visionary, but achievable, equitable, and impactful across all communities.



19. A Call to Action from the Next Generation

MEASURES

YOUTH LEADERSHIP IN DECISION-MAKING

1) DIRECT PARTICIPATION IN CLIMATE PLANNING AND IMPLEMENTATION

2) REPRESENTATION FROM COMMUNITIES DISPROPORTIONATELY AFFECTED

3) MEANINGFUL AUTHORITY AND DECISION MAKING OF YOUTH IN POLICY MAKING

19. A Call to Action from the Next Generation

The Hawai‘i Climate Change Mitigation and Adaptation Commission recognizes that the future of our islands rests in the hands, and voices, of the generation that will inherit the consequences of today’s decisions. This chapter is a powerful, unvarnished statement co-authored by over 20 youth organizations. It serves as a mandate, reminding us all that climate change is no longer a distant threat - it is actively reshaping Hawai‘i, calling for systemic change that matches the urgency of Lāhainā, rising seas, and worsening drought. The following policy priorities, grounded in aloha and mālama ‘āina, demand we move past half measures to prioritize climate justice, equitable decarbonization, and the integration of ‘āina-based education so that every young person is empowered to lead the state toward the thriving, resilient future they choose to build.

Our Future, Our Kuleana

We, the youth of Hawai‘i, speak as the generation that will live with the consequences of every decision made today. Climate change is not a distant threat—it is reshaping our islands now. From the Lāhainā wildfires to flooded roads, coral bleaching, worsening droughts, and rising heat, our home is being pushed beyond what it can sustain.

We refuse to inherit a future defined by loss. We choose to build one rooted in aloha, care, and a future we can stand in with pride.

When we envision our future, we see **a Hawai‘i where everyone can truly thrive** - where clean air, fresh water, healthy food and clean energy are part of everyday life, not privileges. Yet we also recognize the reality we face: our communities stand at the edge of an accelerating climate crisis, one that threatens to make daily life a struggle for survival rather than a chance to flourish. This is not a future we accept.

Our vision remains clear and grounded: **A Hawai‘i where all communities thrive, where culture and ‘āina are protected, and where every young person has the chance to live well.** To realize this, we cannot settle for symbolic gestures or slow reforms stretched across decades. The time for half measures has passed. The moment for bold, youth-driven climate action is here - not in some distant future, but now.

1. Climate Justice and Equity for the Future

The climate crisis is fundamentally a justice crisis. Communities with the least resources carry the heaviest impacts. Native Hawaiian, Pacific Islander, rural, immigrant, and low-income families face disproportionate threats to housing, health, and climate impacts. The basic rights previous generations took for granted, from adequate housing to clean water access, are disintegrating before we can even dream of them.

The rights that previous generations took for granted - not just affordable homes, but the chance to dream about the future are slipping out of reach. The Hawai‘i State Climate Commission has

stated clearly: **the decisions made in this decade will determine the conditions of life for our generation and the next.**

We recognize the decision made in *Navahine v HDOT* ultimately solidified our right to a life-sustaining climate as recognized by all three branches of our state government.

Action: Youth Leadership in Decision-Making

We call for a **permanent Youth Climate Council** (ages 14–26) with:

- **Direct participation in climate planning and implementation**
- **Representation from communities disproportionately affected**
- **Meaningful authority and decision making of youth in policy making**

Young people are already leading from organizing to shaping legislative testimony. We are not the “future leaders.” We are leading now, and we are ready to be guided and mentored for our future role as community and state leaders.

Action: Equity and Justice in Policymaking

We must recognize that our community is only strong when every person and every living system has the opportunity to thrive. Decision-making at the highest levels must actively evaluate who benefits and who bears the burden. This means applying a justice and equity lens to all policy so that those who have been most affected by climate impacts are centered in our fight.

Action: Global Solidarity

We recognize Hawai‘i’s place within the Pacific—not isolated but connected to communities facing parallel climate threats. As rising seas, extreme weather, and ecosystem loss take hold across our region, we call for Hawai‘i to **actively support and strengthen existing initiatives** that create the space for collaboration and resilience among island communities, including the **Local2030 Islands Network**. These programs already bring together Pacific voices to share climate adaptation strategies, uphold cultural continuity, and advance just transitions grounded in place and community.

We urge our state to advocate for stronger U.S. commitments to global climate finance, especially for island nations already experiencing displacement and loss. And whether migration is driven by climate impacts, economic pressures, or cultural and familial needs, Hawai‘i must create diaspora spaces that are welcoming, spreading a sense of aloha, solidarity, and shared responsibility for all who seek community and safety here.

2. Education, ‘Āina, and the Green Workforce

We must prepare young people in Hawai‘i with climate education that empowers and accelerates understanding and youth leadership. We need education that embraces the concept that “every career is a climate career” as we prepare young people for future careers.

Centering 'Āina-Based Education

As youth in Hawai‘i, we're not just reading about climate change in textbooks or online; we're living amidst its impacts every day. For Native Hawaiian youth, each climate impact cuts deeper into cultural heritage. The devastating 2023 Lahaina fires, which the National Weather Service says claimed 101 lives, show how climate change ushers in unprecedented threats and erases irretrievable pages of our mo‘olelo.

By 2030, we demand the state provide ‘āina-based education and stewardship opportunities that foster connection to land, ‘ohana, and communities, and create pathways for local-global servant leadership.

Action: Educational Reform and Green Jobs

- **Curriculum Integration:** Reform the school curriculum in full by mandating the incorporation of the University of Hawai‘i's climate science modules and integrating ‘āina-based and indigenous knowledge directly into the K-12 curriculum (public and private).
- **Green Job Training:** Fund and expand paid, hands-on training programs in renewable energy, sustainable agriculture, loko i‘a and watershed restoration, wildfire prevention, disaster response, and sustainable design. As of 2023, only three of Hawai‘i’s high schools offered pathways into clean energy careers and as the writing of this chapter, only one high school remains in the clean energy pipeline program. We must close this gap so that students graduate ready to help build a resilient Hawai‘i.
- **Youth Exchange:** Create accessible inter-island youth exchange programs focused on cultural resilience and climate solutions, allowing students to learn from each other, collaborate across islands, and strengthen our shared sense of responsibility to ‘āina and community.

3. Sector Priorities for Youth-Led Climate Action

1. **Energy and Transportation** - Right now, many of us are trying to reduce our carbon footprint—but it’s hard when our entire system still depends on fossil fuels. We don’t want our communities to be forced into high-emission lifestyles just because there aren’t better options. Hawai‘i has plans to reduce transportation emissions, but we’re still not on track to meet our climate goals. We need to move faster, and we need solutions that are accessible and community-centered.

We call to:

- **Expand public transit access** with reliable routes, shaded stops, express lanes, and free or low-cost ridership, so taking the bus is actually convenient.
- **Increase renewable energy in everyday places** like schools, homes, and public buildings, including requiring solar + storage in new developments.
- **Reduce dependence on imported fuels** and reinvest those savings into community resilience projects that directly benefit local families.
- **Support cleaner transportation options** by making EVs and charging cheaper and more accessible, especially on outer islands, and by improving walkability and bike-friendly streets.

- 2. Regenerative Local Food Systems** - Food security is cultural security. Our food traditions, community health, and connection to ‘āina are at risk as droughts and climate change impact local agriculture. Hawai‘i imports the majority of its food, which leaves us vulnerable. Strengthening local food systems is not just about sustainability—it’s about honoring culture and ensuring our communities can feed themselves.

We call to:

- **Strengthen farm-to-school and farm-to-community pathways** so that more local food ends up in school cafeterias, community programs, and everyday meals.
 - **Support young and new farmers** with paid apprenticeships, access to land, shared tools and infrastructure, and training grounded in Indigenous farming practices.
 - **Restore Indigenous food systems and mālama ‘āina** through kalo farming, loko i‘a, watershed restoration, and community food sovereignty.
 - **Make local food the norm**, not the exception, by coordinating statewide efforts to reach Hawai‘i’s “30 by 2030” goal.
- 3. Economy, Tourism, and Infrastructure** - A resilient Hawai‘i means putting people and place first. Tourism is a big part of our economy, but it relies on the same natural and cultural resources that are being stressed by climate change. At the same time, housing is becoming less affordable, and infrastructure isn’t keeping up. We need an economy that supports our communities instead of extracting from them.

We call to:

- **Ask tourism to give back to the land it depends on**, including implementing a Green Fee that helps protect beaches, reefs, trails, and cultural sites.
- **Treat housing as a human right**, supporting renters, preventing displacement, and investing in neighborhoods where local families can stay and thrive.
- **Prioritize climate-resilient infrastructure**—not just reacting to disasters, but preparing ahead of time, from stronger buildings to better transit and safer coastlines.
- **Implement carbon cashback** programs to incentivize decarbonization and return emissions revenue to residents

4. Climate Health and Community Wellness

The mental and physical health impacts of climate change are real. Youth across Hawai‘i report rising rates of anxiety, grief, displacement trauma, and stress from heat, smoke, and disaster.

We call for:

- **Mental health support systems in schools and communities**, including climate grief and trauma-informed counseling
- **Heat and air quality protections** for students, teachers, kūpuna, outdoor workers, and unhoused residents

5. Our Commitment and Expectation of Accountability

Young people are stepping forward—not as a symbolic “next generation,” but as leaders already shaping Hawai‘i’s future. Students across the islands are realizing the power of their voices in advocacy and policy. From testifying on bills to organizing campaigns, designing solutions, and mobilizing peers, we have demonstrated that we care deeply about the future we will inherit.

But our passion cannot be used as a substitute for structural action. We need institutional courage and systemic change that matches the urgency we are living through.

We will be paying attention—not only from hearing rooms but increasingly from the voting booth. The question is not whether youth voices matter, but how today’s leaders will choose to respond. Will they be remembered as those who listened, adapted, and stood with their communities—or as those who delayed while the impacts intensified?

The ocean will not wait for our plans to be convenient. The fires, storms, and heat will not pause for our timelines. If we act with honesty and urgency, we can still protect the Hawai‘i we love. The time for half measures has passed. Our voices must be heard now.

Youth Contributors (Condensed Summary)

This statement was co-authored and reviewed by **over 20 youth leaders** (ages 14–26) representing **public, private, charter, and homeschool communities** across **Kaua‘i, Hawai‘i Island, Maui, O‘ahu and Hawai‘i students studying on the continent**, in collaboration with statewide youth coalitions.

Participating Youth Groups and Networks

- Climate Future Forum (CFF) — All Working Groups
- Hawai‘i Youth Climate Coalition (HYCC)
- Hawai‘i Youth Transportation Council
- Hawai‘i Youth Food Council
- Hawai‘i State Student Council & BOE Student Leadership Network
- Punahou Sustainability Fellowship
- Iolani Sustainability & Climate Action Councils
- Le Jardin Global Citizen & Climate Health Ambassadors
- Citizens’ Climate Lobby – Youth Chapter
- Carbon Cashback Hawai‘i
- Sierra Club of Hawai‘i – Youth Organizers
- Wild Communities Foundation
- Trevor Project Youth & Family Research Advisory Council
- Davis Democracy Fellows
- Papahana Kuaola / ‘Āina-Based Education Programs
- Future Farmers of America (Hawai‘i)
- Vibrant Hawai‘i: KōCreators
- College Corps & University Sustainability Fellows
- UH Law ELP Youth Research Partners



20. Conclusion

Hawai‘i, a state uniquely vulnerable to the escalating impacts of climate change due to its isolated island geography, has long demonstrated international leadership in comprehensive climate action. This Climate Action Pathways (CAP) builds upon nearly two decades of progressive legislative and policy frameworks. It represents a collaborative effort involving state agencies, counties, technical experts, academic institutions, and a diverse array of community and non-profit organizations across the islands. The CAP outlines strategic pathways to achieve Hawai‘i’s ambitious climate goals: a 50% reduction in greenhouse gas (GHG) emissions below 2005 levels by 2030, and the pioneering commitment to achieve net-negative emissions by 2045.

Beyond mitigation, this plan is deeply rooted in the principles of aloha ‘āina (love for the land), the circular and wellbeing economy, and self-sufficiency, aiming to enhance resilience, create high-quality jobs, spur economic growth, and improve the quality of life for all residents, particularly low-income and disadvantaged communities (LIDACs). The CAP identifies 36 key measures across critical sectors - Energy Industries, Buildings Energy Efficiency, Transportation, Agriculture, Forestry, and Other Land Use (AFOLU), and Waste and Material Management - each designed to contribute significantly to Hawai‘i’s decarbonization targets.

Energy Industries:

The energy sector in Hawai‘i is undergoing a profound transformation. The state is committed to achieving a 100% Renewable Portfolio Standard (RPS) for electricity generation by 2045, with interim targets of 40% by 2030 and 70% by 2040. This ambitious goal is driven by the economic imperative to reduce reliance on expensive imported fossil fuels, which currently account for approximately 80% of total energy consumption and result in the nation’s highest electricity prices. Key measures include the rapid deployment of utility-scale and distributed solar photovoltaic (PV) systems, wind farms, and the strategic utilization of geothermal energy. Crucially, the plan emphasizes massive investments in utility-scale battery energy storage systems (BESS) and innovations such as advanced grid technologies like smart grids and microgrids, and the exploration of alternative fuels as bridging solutions. The sector’s success is foundational to decarbonizing other sectors, as electrification strategies rely on a clean grid.

Buildings and Energy Efficiency:

Recognizing that energy burdens are born by inefficiencies in both residential and commercial buildings, this sector focuses on reducing energy demand in both existing and new constructions. Measures include implementing solar PV and solar hot water systems in residential and non-residential buildings, with a target of solarizing 10,000 rooftops annually until 2030. A comprehensive building retrofitting plan aims to achieve a 46.4% reduction in energy consumption by 2040 and 60% by 2050, supported by the Energy Efficiency Portfolio Standard (EEPS) goal of 6,000 GWh cumulative savings by 2045. Furthermore, new building codes, specifically the adoption of the 2021 International Energy Conservation Code (IECC) by 2030, will decrease energy consumption in new buildings by 10%, alongside mandating solar water heaters in new residential constructions. These efforts are critical for reducing energy burdens, stabilizing high electricity costs and enhancing energy security.

Transportation:

Decarbonizing Hawai‘i’s transportation sector is a monumental task given its reliance on air and marine transport for inter-island connectivity and tourism. The CAP outlines a multi-pronged approach across ground, air, and marine modes. For ground transportation, mode shift initiatives reduce transportation burdens, and promote sustainable alternatives such as walking, biking, and public transit through multimodal network implementation, transit-oriented development, and road usage pricing. Other measures include widespread vehicle electrification including transitioning state and county fleets to EVs, EV rentals, expanding charging infrastructure and fuel decarbonization (supporting clean fuel standards, carbon taxes, and local production of clean fuels like ethanol blends). In air transportation, the focus is on decarbonizing fuels through Sustainable Aviation Fuel (SAF) adoption, reducing fuel consumption by optimizing airport operations, and electrifying airfield vehicles. For marine transportation, measures promote renewable fuels (biodiesel, bio-LNG, e-methanol, green hydrogen) and implement fuel consumption efficiency in

cruise ships by reducing calls and size. The sector aims for zero emissions across all modes by 2045.

Agriculture, Forestry, and Other Land Use (AFOLU):

The AFOLU sector holds immense potential for carbon sequestration and strengthening local food systems. Hawai‘i’s AFOLU sector is already a net carbon sink, offsetting 7% of total gross emissions. Measures focus on enhancing this capacity through agricultural soil amendments, capturing carbon in soils using waste streams, biochar, and regenerative agriculture practices, and reforestation. Goals include planting 11 million native trees and plants, preserving 23,000 acres of forested lands, and protecting 30% of priority watersheds by 2030. Wetland restoration, including 20 wetland and loko‘ia sites, is also a key component. These actions are rooted in aloha ‘āina and traditional ecological knowledge, aiming to heal degraded lands, prevent and remove invasive species, reduce wildfire risk, and improve water quality.

Waste and Material Management:

This sector aims to minimize waste generation and maximize resource recovery. Key measures include aggressive waste diversion targets of 70% by 2030 and 90% by 2045, moving away from landfilling and incineration. This involves infrastructure investments in regional material recovery hubs, advanced sorting facilities, remanufacturing centers, and repair/reuse marketplaces. Composting is a significant focus, aiming to treat 70% of the organic waste fraction by 2030 and 90% by 2045 through a decentralized, community-based compost network. Waste reduction efforts are supported by legislation redefining producer accountability for imported goods, targeting a 10% reduction in paper, cardboard, and plastic waste by 2040. The plan also addresses wastewater management, including efforts to address substandard cesspools and expand recycled water programs, contributing to water security.

Benefits for the People of Hawai‘i:

The implementation of the CAP measures is anticipated to yield a broad spectrum of benefits, significantly enhancing the quality of life, economic well-being, and resilience of all Hawai‘i residents, with a particular focus on equitable outcomes for Low-Income and Disadvantaged Communities (LIDACs).

Improved Public Health and Environmental Quality: The reduction in greenhouse gas emissions across all sectors will lead to significant co-pollutant reductions (NO_x, PM_{2.5}, SO₂, VOC, HAP). This directly improves air quality, reducing respiratory and other health issues, particularly in communities near industrial areas or high-traffic corridors. Enhanced waste management practices, including reduced landfilling and improved wastewater treatment, will lead to better water quality, protecting vital marine ecosystems and public health. Forest and wetland restoration efforts will improve biodiversity, enhance natural flood protection, and provide cooler urban environments, directly benefiting community well-being.

Economic Benefits and Affordability: The transition to a clean energy economy is a powerful economic driver. Reduced reliance on imported fossil fuels will stabilize and lower Hawai‘i’s notoriously high electricity prices, providing significant financial relief to households and businesses. Investments in renewable energy, energy efficiency retrofits, and sustainable agriculture will create high-quality, local jobs across various sectors, fostering economic growth and diversification beyond tourism. Investments in local food systems and circular economy

initiatives will enhance food security and create new economic opportunities within the islands, reducing vulnerability to global supply chain disruptions.

Enhanced Climate Resilience: The CAP measures directly address Hawai‘i’s vulnerabilities to climate impacts. Investments in resilient infrastructure, such as hardened energy grids and improved transportation networks, will better withstand extreme weather events, sea-level rise, and coastal erosion. Nature-based solutions, including forest and wetland restoration, will enhance natural defenses against flooding and wildfires. Decentralized energy systems and microgrids will improve energy security and provide resilience during outages. These efforts are crucial for protecting communities, critical infrastructure, and natural resources from the unavoidable impacts of climate change.

Equitable Outcomes for Low-Income and Disadvantaged Communities (LIDACs): A core principle of this CAP is to ensure that the benefits of climate action flow equitably to LIDACs, which are disproportionately affected by climate change and high living costs. Hawai‘i has adopted a customized methodology for identifying LIDACs, going beyond national screening tools to capture localized vulnerabilities, including all Hawaiian Homelands tracts. The CAP explicitly aims to reduce the energy burden on LIDAC households through programs like GEM\$, HEAR/HOMES energy rebate programs, and appliance replacement initiatives. Workforce development strategies are designed to create pathways to sustainable careers for residents from these communities, prioritizing Native Hawaiians, Pacific Islanders, rural communities, women, youth, formerly incarcerated individuals, and people with disabilities. This includes providing wraparound services such as childcare, transportation, stipends, developing stackable credentials, and fostering partnerships with community-based organizations (CBOs) like the Council for Native Hawaiian Advancement and Kupu.

Workforce Development:

The CAP recognizes that a skilled workforce is essential for achieving climate goals. It anticipates significant job growth in sectors such as regenerative agriculture, renewable energy, green building, disaster preparedness, land management, clean transportation, and waste management. Strategies include strengthening workforce partnerships across public, private, non-profit, labor, and academic entities; conducting workforce gap analyses; and developing sector-specific technical skills through targeted training, certifications, and earn-and-learn models. The plan also addresses critical workforce retention challenges, such as Hawai‘i’s high cost of living and lack of affordable housing, advocating for broader economic stabilization policies to ensure that trained talent remains in the state. Messaging efforts will highlight climate careers as meaningful, resilient, and deeply connected to the stewardship of Hawai‘i’s land, waters, and people.

Challenges to Implementation:

The State of Hawai‘i’s CAP sets forth an ambitious and essential roadmap for achieving net-negative emissions by 2045 and building resilience against the escalating impacts of climate change. While the plan is comprehensive and built upon extensive stakeholder engagement, its successful implementation will inevitably encounter significant challenges. Proactive strategies to address these hurdles will be paramount to translating the plan’s vision into tangible outcomes.

Financial Sustainability and Resource Mobilization: A primary and overarching challenge lies in securing the substantial and sustained financial investment required. The CAP identifies a minimum need of \$2.5 billion over the next three years for critical climate projects, a figure that

far exceeds currently available state resources. While the recently enacted "Green Fee" on visitor accommodations is a positive step, it alone is insufficient. The heavy reliance on federal funding, such as that from the Inflation Reduction Act (IRA) and Bipartisan Infrastructure Law (BIL), and significant reduction in that funding makes clear the vulnerabilities and uncertainty of continued funding, posing a serious risk to long-term planning and project delivery. Furthermore, engaging the private and philanthropic sectors, though crucial, presents its own difficulties. Many local businesses operate on thin profit margins, limiting their capacity for climate-related investments, and building sustained relationships with high-net-worth individuals requires dedicated outreach infrastructure. Overcoming this will necessitate a diversified funding strategy, including innovative financing mechanisms, expanded public-private partnerships, and potentially new state revenue streams, alongside consistent advocacy for robust and flexible federal support. Innovative tools such as green bonds could help unlock larger pools of private capital, but their effectiveness depends on stable market conditions and investor confidence. Recent credit rating challenges faced by HECO further complicate the landscape, as utility-sector instability can affect borrowing costs and the state's ability to finance large-scale climate infrastructure.

Regulatory and Permitting Complexities: Navigating Hawai'i's intricate regulatory and permitting landscape can significantly impede the pace of implementation. Existing policy and regulatory barriers such as tariffs on clean energy technologies, coupled with potential uncertainty around emerging technologies, can discourage private investment and delay project initiation. Streamlining these processes while upholding environmental safeguards and ensuring community input will be critical. This requires close collaboration between regulatory bodies, project developers, and affected communities to develop clear, efficient pathways for climate-aligned projects.

Inter-Agency and Cross-Sector Coordination: While the CAP highlights an impressive institutional framework and extensive coordination efforts involving numerous state offices, agencies, county planning offices, legislative representatives, and a wide array of "Hui Participants" (partners from non-profits, academia, and the private sector), the sheer breadth of these stakeholders presents an ongoing coordination challenge. Ensuring harmonized efforts across federal, state, and county agencies, aligning diverse county-level climate action plans with statewide goals, and fostering genuine, sustained partnerships with the private sector and communities will require continuous communication, shared understanding, and adaptive governance. The document itself emphasizes the need to deepen and continue partnerships, underscoring that this is an ongoing endeavor, not a one-time achievement.

Unique Geographic and Socio-Economic Realities of Hawai'i: The distinct characteristics of an isolated island chain introduce several unique implementation hurdles:

- *Island Geography* - The dispersed nature of the islands complicates inter-island clean transportation solutions (e.g., electric aircraft, hydrogen ferries), requiring significant technological maturity and infrastructure development.
- *Import Dependence* - Hawai'i's reliance on imported goods means that "upstream" emissions from international shipping and air travel, often excluded from state-level inventories, are significant and challenging to address through direct state policy.
- *High Cost of Living and Energy* - The elevated costs of electricity and goods can hinder the affordability and widespread adoption of new technologies like electric vehicles (EVs) and sustainable fuels without robust incentive programs.

- *Limited Land Availability* - Densely populated islands face land constraints that challenge the expansion of renewable energy infrastructure and transportation networks.
- *Infrastructure Vulnerability* - Existing infrastructure is highly susceptible to climate impacts like sea-level rise and extreme weather, necessitating substantial investment in adaptation and resilience alongside decarbonization efforts.

By acknowledging these challenges transparently and committing to these proactive strategies, Hawai‘i can reinforce its leadership in climate action and move closer to its vision of a regenerative and just transformation.

The Path Forward

Implementation has already begun, with renewable energy projects coming online, electric vehicle adoption accelerating, and restoration projects breaking ground across the islands. But the full transformation envisioned in this plan will require sustained commitment from all sectors, government, business, nonprofits, and communities working together with the urgency the climate crisis demands.

The CAP acknowledges significant challenges ahead: securing sustained funding, navigating complex permitting processes, coordinating across multiple jurisdictions, and maintaining public support through what will inevitably be a long-term transformation. But it also recognizes that Hawai‘i has unique advantages: strong environmental values, innovative spirit, collaborative governance structures, and communities with deep connections to the land and ocean.

Perhaps most importantly, the plan embodies hope, not the passive hope that problems will solve themselves, but the active hope that comes from having a clear vision and the tools to achieve it. It recognizes that while climate change presents existential challenges, responding to those challenges can create opportunities to build the kind of society many have long dreamed of, one that runs on clean energy, provides meaningful work for everyone, manages resources sustainably, and prioritizes the wellbeing of both people and planet.

The path is clear, the community is engaged, and the work has begun. Hawai‘i's climate future is being written today, one solar panel, one native tree, one community project at a time. The question isn't whether this transformation is possible, it's how quickly it can be achieved and how broadly its lessons can be shared with a world desperately in need of climate hope and practical solutions.

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CLIMATE ACTION PATHWAYS 2025

The Hawai'i Climate Change Mitigation and Adaptation Commission (CCMAC) consists of a multi-jurisdictional between 20 different departments, committees, and counties to guide policy and make recommendations to accelerate climate action.



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