KAUA‘I CLIMATE ADAPTATION PLAN

Technical Advisory Group Meeting #2

2/24/2022 | 5:30PM HST

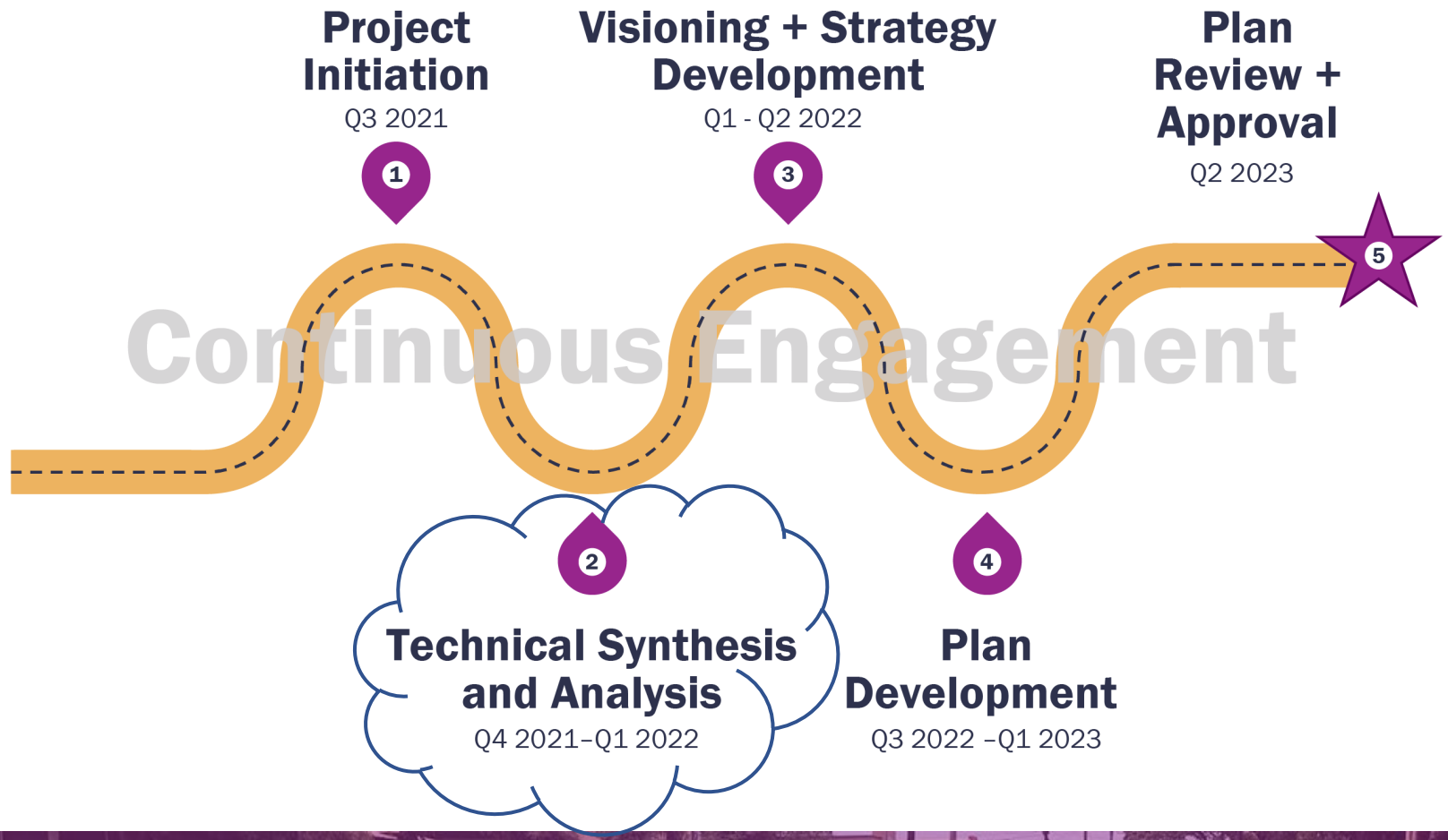
TAG #2 Purpose – Working Meeting!

- Provide a brief update on the CAP process
- Present the initial Discussion Draft Vulnerability and Equity Analysis findings
- Refine, build on, and incorporate your knowledge, experiences, ideas, and research into the Discussion Draft

TODAY'S AGENDA

1. Brief update on CAP process (5:35pm)
2. Discussion Draft of Vulnerability and Equity Analysis (5:40pm)
    1. Purpose and Methods
    2. Key High-Level Findings
3. Sector break out rooms (6pm)
4. Large group report back (7pm)
5. A look ahead (7:20pm)

Project Schedule



Technical Synthesis & Analysis

Climate Hazards White Paper

- Brief white paper summarizing climate hazards and stressors, building on existing work

Vulnerability & Equity Analysis

- Summary of vulnerability assessments for the County, building on existing work
- Creating a social vulnerability assessment
- Publishing through an online mapping tool

Adaptation Strategy Menu

- Matrix of existing, proposed, and potential adaptation strategies and actions

Outreach and Engagement

Completed

- Stakeholder interviews + summary
- Talk stories + summary
- Story Bank is live on the website
- Factsheets posted on the website
- Informational videos posted on website
- One pop-up at Lihu‘e Night Market

Upcoming

- Open houses
  - Virtual
  - In-person
- Community Survey on Climate Change in Kaua‘i

https://kauaiadaptation.com/

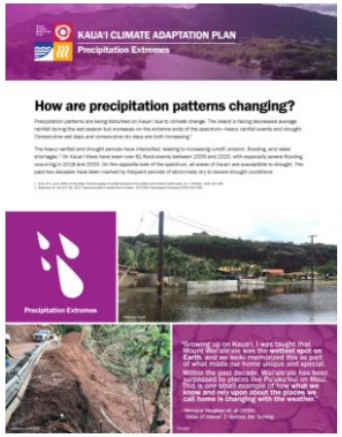
Project Factsheets

Download and share these factsheets about climate hazards, exposures, and vulnerabilities!

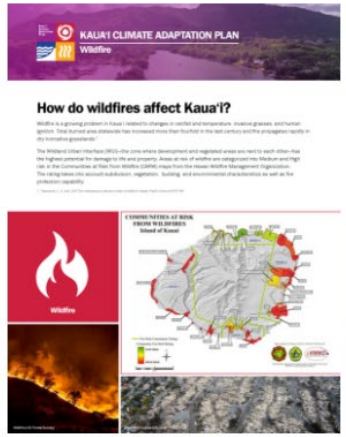
Project Factsheet

Sea Level Rise Factsheet

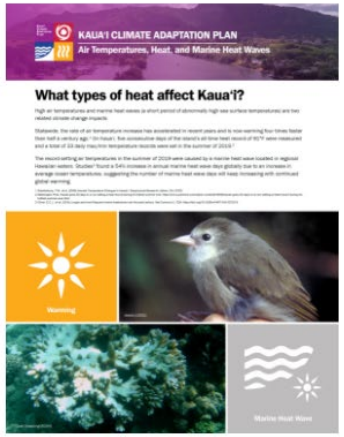
Tropical Cyclone Factsheet



Precipitation Extremes Factsheet



Wildfire Factsheet



Heat Factsheet

Project Videos

Learn more about the impacts of climate hazards!

Introduction to the Climate Adaptation Plan

How will Sea Level Rise Impact Kaua'i?

What do Changing Precipitation Patterns Mean for Kaua'i?

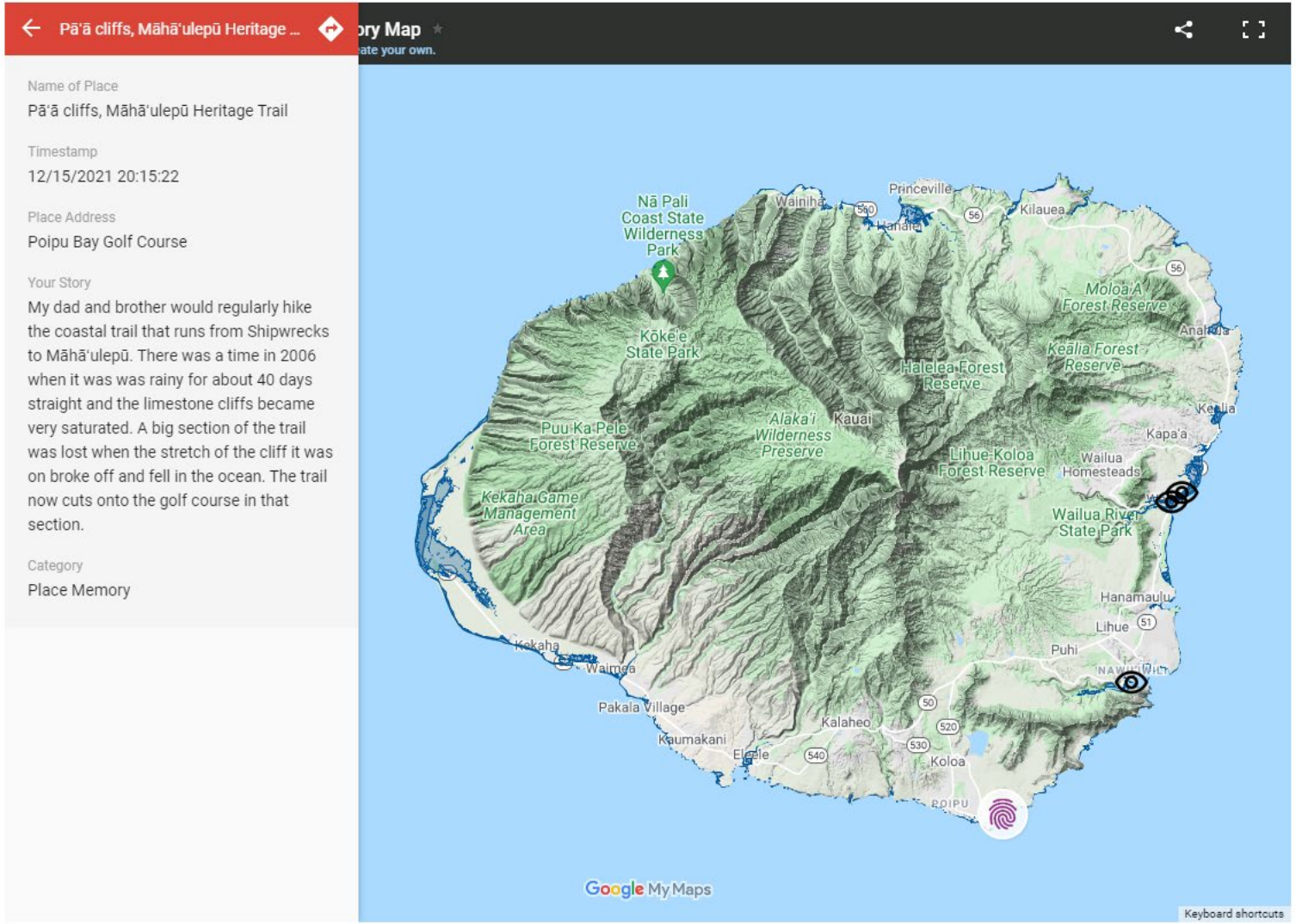
How might Higher Temperatures Impact Kaua'i?

https://kauaiadaptation.com/

Story Map

Submit a story!
Use the QR code below to access the website and go to "History" >> "Story Bank"

https://kauaiadaptation.com/story-bank/



Vulnerability and Equity Analysis Discussion Draft

Purpose of the Vulnerability and Equity Analysis

- **Screening analysis / scan to broadly understand the exposures and vulnerabilities** (e.g., not a detailed analysis or review)
- **Summarize existing plans and analyses** related to climate change on Kaua‘i
- Build an initial understanding of **where certain adaptation strategies should be applied** (part of the next stage of plan development)

Review of Existing Plans and Studies

- County docs: 2018 General Plan, MHMP, West Kaua‘i Community Vulnerability Assessment, Coastal Hazards Assessment
- State agency docs: HDOT, HTA, DNLR
- Studies: National Climate Assessment, EcoAdapt Vulnerability Assessments
- Stakeholder interviews, TAG Homework, UH 2018 flood research

What does the Analysis Cover?

- **Kaua‘i Profile:** Summary of existing conditions
- **Island-wide Climate Hazards:** Island-wide hazard profile, mostly drawn from the MHMP analysis and the KCAP Climate Hazard White Paper
- **Planning Area Hazard Exposures**: Assets exposed (by planning area and community) to wildfire, flood, landslide, and SLR
- **Island-Wide Critical Vulnerabilities and Planning Issues:** Systems-level vulnerabilities

Definitions

Vulnerability is the degree to which natural, built, and human systems are at risk of exposure to climate change impacts. Vulnerability is considered a function of exposure, sensitivity, and adaptive capacity

- **Exposure**: the presence of people, infrastructure, natural systems, and economic, cultural, and social resources in areas that are subject to harm
- **Sensitivity**: the degree to which a species, natural system, or community, government, and other associated systems would be affected by changing climate conditions
- **Adaptive capacity**: the ability to adjust to potential damage, to take advantage of opportunities, or to respond to consequence

Methodology – Exposure Analysis

Hazards

- Wildfire risk (H, M, L)
- 1% chance annual flood
- Landslide risk
- 1.1 ft SLRXA and its component parts
- 3.2 ft SLRXA and its component parts
- 6 ft SLR passive flooding

+

Assets

- Critical Facilities, transportation
- Development: buildings, affordable housing developments, hotels and rentals
- Cultural and natural resources: cultural features, coral reefs, fish ponds, parks, existing agricultural use, Hawaiian Homelands

Methodology – Exposure Analysis

The planning area analysis tables and maps highlight the most important points

- Exposures by Census Place: GIS analysis supplemented with visual analysis
- Planning Area Assets Exposed: GIS analysis

Table 11. Summary of Assets Exposed to Hazard in West Kaua'i

Asset	Fire Risk (H-High, M-Med, L-Low)	FEMA 1% Chance Annual Flood	Landslide	SLRXA-1.1 (2050)	Passive Coastal Flooding (2050)	High Wave Flooding (2050)	Coastal Erosion (2050)	SLRXA-3.2 (2100)	Passive Coastal Flooding (2100)	High Wave Flooding (2100)	Coastal Erosion (2100)	NOAA 6 ft SLR (2100)
Points												
Critical Facilities	85 (H) 1 (M)	44	9	7	3	3	2	13	6	10	4	29
Buildings	5,769 (H) 98 (M)	2,224	45	96	0	22	20	456	48	269	142	779
Affordable Housing Developments	8 (H)	3	0	0	0	0	0	0	0	0	0	0
Bridges	8 (H)	8	8	0	9	9	3	0	9	9	5	1
Bus Stops	30 (H)	17	0	0	0	0	0	5	0	4	0	5
Hotels and Rentals	8 (H) 90 (L)	7	0	0	0	0	0	0	0	0	0	1
Cultural Features[1]	45 (H)	50	15	18	3	11	6	35	3	26	10	12
Fish Ponds	0	0	0	0	0	0	0	0	0	0	0	0
Acres												
Coral Reefs[2]	0	678	0	0	-	-	-	893	-	-	-	893
Parks	42 (H)	28	0	0	-	-	-	0	-	-	-	28
Existing Agricultural LU	2,765 (H) 1,486 (M)	884	32,321	0	-	-	-	0	-	-	-	9
Hawaiian Homelands	112 (H)	38	5,380	2	-	-	-	7	-	-	-	0

1. *The County does not have a complete spatial dataset of culturally significant resources and sites, and some cultural data points are intended to be representational and not precise. Therefore, the total number of cultural sites exposed to hazards is likely to be underrepresented*
2. *For coral reefs and parks, acres reflect the entire area of a polygon regardless of how much of it is exposed to the hazard. For Hawaiian Homelands, only the acres which are exposed to a composite layer (fire, flood, landslide, the 2050 and 2100 SLRXA, and 6 ft SLR flooding) are counted. Hawaiian Homelands in the subarea are Waimea and Kekaha Hawaiian Homelands.*

Source: County of Kaua'i, Raimi + Associates

Methodology – Exposure Analysis

Table 10. West Kaua'i Hazard Exposures by Census Place

Community	Hazard Exposures

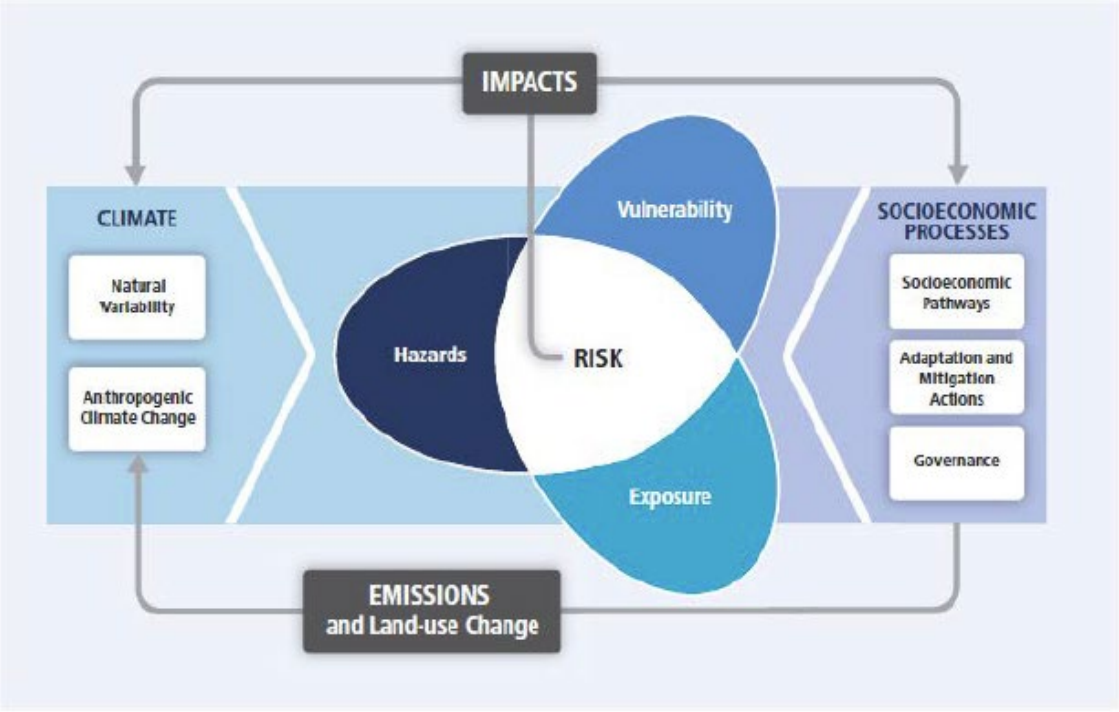
Kekaha	• Nearly all development in the town (primarily residential) is exposed to flood and high wildfire hazard. Almost the entire town has a low SVI score (20th percentile), except for the portion directly west of the old sugar mill (90-100th percentile). This area contains two affordable housing developments with a total of 114 units.
	• All 13 critical facilities identified in the MHMP are exposed to high wildfire risk; eight of those are also exposed to 1% chance annual flood. Both bridges are exposed to even more hazards:
	  ◦ The bridge where Kaumuali'i Highway crosses drainage canal 4 (next to Kekaha Beach Park) is exposed to high wildfire hazard, 2050 SLRXA-1.1 (passive and high wave flooding), 2100 SLRXA-3.2 (passive and high wave flooding), and NOAA 6 ft SLR projected coastal flooding.
	  ◦ The bridge where Kaumuali'i Highway crosses drainage canal 3 is exposed to high wildfire hazard, 1% chance annual flooding, and 2100 SLRXA-3.2 (coastal erosion).
	• The Kekaha Waste Facility (the only one on the island) is not directly within hazard exposure areas, but land mauka and makai are exposed to SLR, flooding, and wildfire.

PMRF	• SLR-XA and flood exposure in the Mana Plain up to Kaumuali'i Highway. • Facilities makai of Kaumuali'i Highway (including Barking Sands Airport) are at high wildfire risk. There is also SLR exposure on Barking Sands Beach.
Waimea	• All development in the town (residential and commercial development) is at high wildfire risk. 91% of the town's population is exposed per the MHMP. The east and southern portions of the town are also exposed to flooding around Waimea River and Menehune Ditch. • The town has moderate SVI scores (50-60th percentile). • Critical facilities in the town that are subject to multiple hazards include the fire station, police station and the bridge where Kaumuali'i Highway crosses the ditch. The Veterans Memorial Hospital exposed only to wildfire. • Waimea Wastewater Treatment Plant is exposed to 1% chance annual flood and NOAA 6 ft SLR projected coastal flooding. • The entire length of Waimea Canyon drive is exposed to landslide risk.

Selected Key Findings

People – Key Findings

In the context of climate change, social vulnerability refers to the **inherent characteristics** of a population or system that makes them **more susceptible to and less able to withstand adverse impacts**

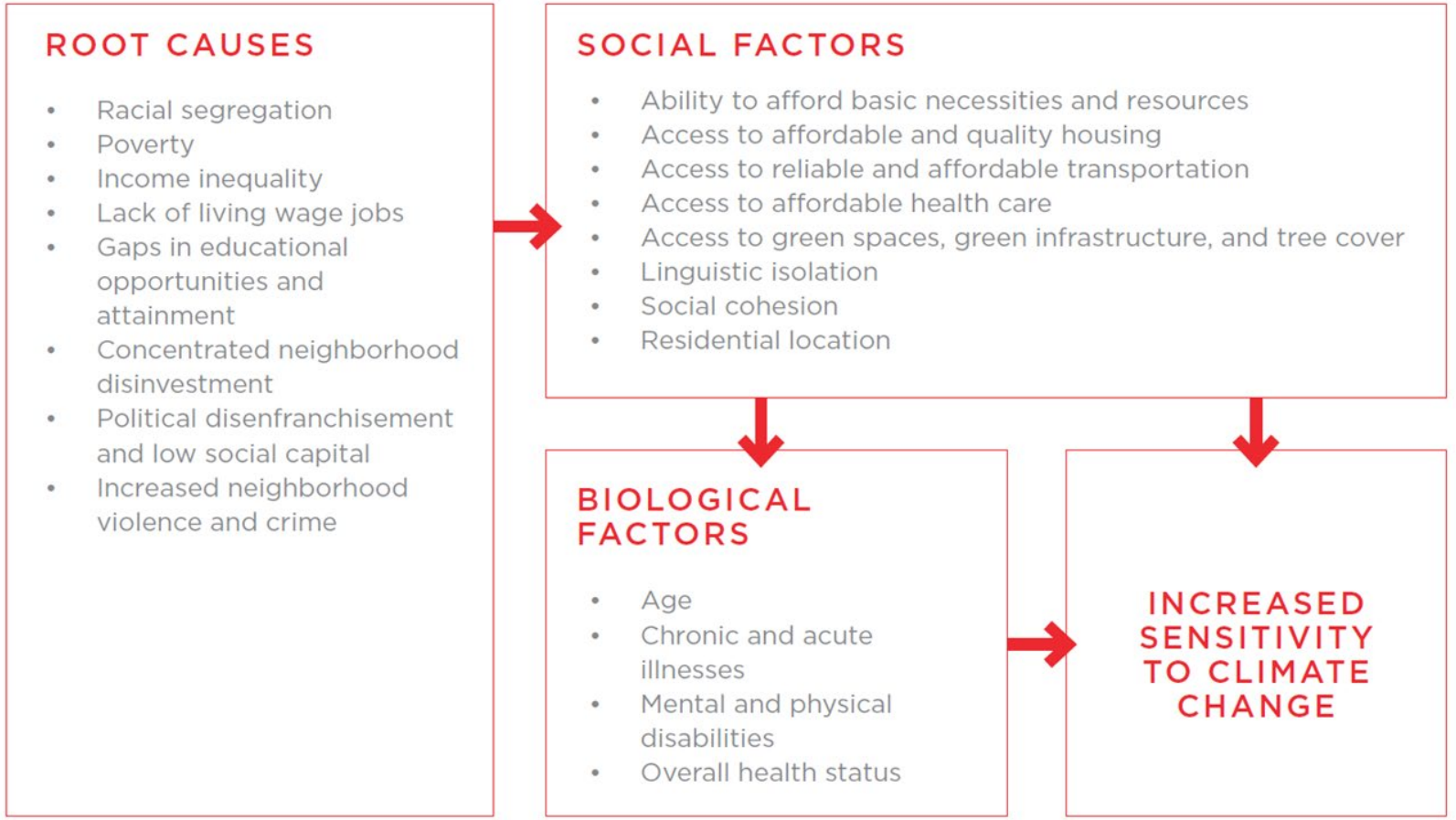


Source: WGII AR5

Climate Change is a Stress Multiplier Amplifying Existing Inequities and Sensitivities

- Older adults: Four block groups have *very high* and two have a *high* older adult population compared to the rest of the county
- Older housing: Three block groups have *very high* and four have a *high* percentage of pre-1970 housing
- Vehicle access: Three block groups have *very high* and five have *high* percent of no-vehicle households compared to the rest of the county

Contributing Causes of Social Vulnerability

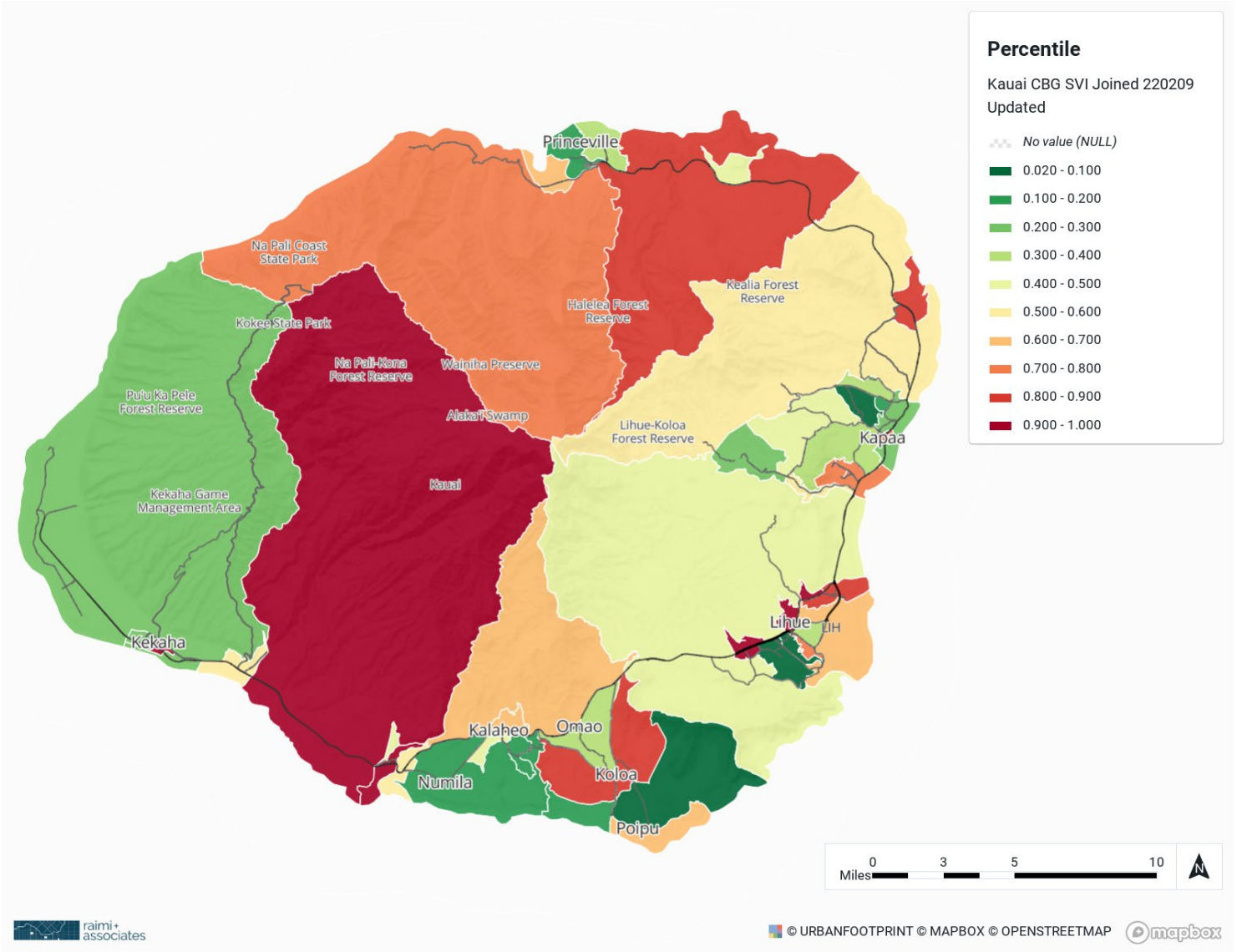


People – SVI Indicators

- Household Characteristics
  - Age 65 or older
  - Age 17 or younger
  - Any Disability
- Socioeconomic Status
  - Age 25 with less than BA degree
  - Income below $75,000 (ALICE annual survival budget)
  - Outdoor workers
- Race and Ethnicity
  - Native Hawaiian or Pacific Islander identifying
  - Linguistic Isolation
- Physical Conditions
  - Renter occupied housing units
  - Housing cost burdened
  - Pre-1970 housing
  - Mobile homes
  - No vehicle

People – SVI Key Findings

- Lihuʻe and West Kauaʻi planning areas have the most highly socially vulnerable CBGs in the county (3)



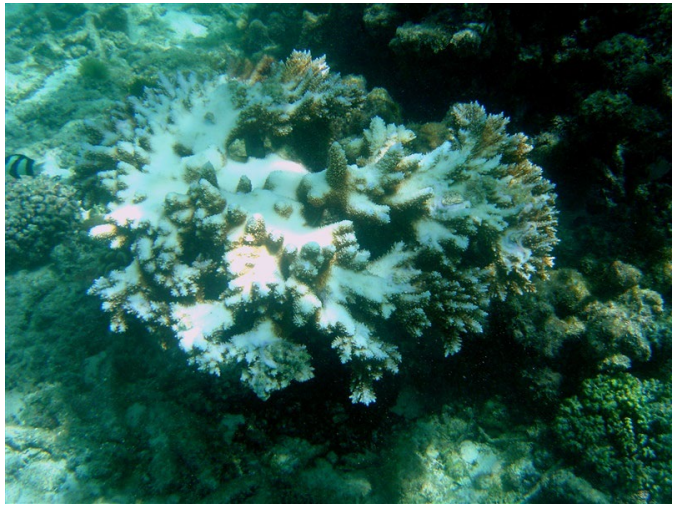
People – SVI Key Findings

- Of the 11 census block groups with high or very high social vulnerability scores, **six are exposed to all (or almost all) of the hazards analyzed**

- Tract 408 BG 1: Pakala Village – Hanapepe
- Tract 408 BG 3: Hanapepe
- Tract 409 BG 5: Kekaha
- Tract 404 BG 3: Hanama‘ulu
- Tract 9400 BG 2: Anahola
- Tract 401.03 BG 1: Outer Kilauea - Kalihiwai

Natural Resources

- Ecosystems are disturbed by all climate shocks and stressors, which shift habitat of native species and promote the spread of invasive species
- Forest birds: Loss of range, vector-borne diseases and threat of extinction due to warming
- Corals reefs: by midcentury, bleaching events are projected to occur annually due to ocean temps, deoxygenation, and acidification. Impacts to biodiversity and shore protection
- Fish and other sea life: Declining fish richness and abundance due to ocean warming. Loss of resting and nesting habitat due to SLR



Cultural Resources

- Upland forest: loss of native species impacts the perpetuation of knowledge and connection of people to the natural and cultural resources. Collection of materials for traditional practices is becoming more difficult
- Traditional agriculture: precipitation and SLR/flooding impacts on food and fiber systems
- Nearshore waters: SLR impacts (especially erosion, flooding, saltwater intrusion) threaten iwi kupuna, gathering marine life, salt ponds, and fishponds. Salt harvesting is also impacted by temperature changes

*The County does not have a complete spatial dataset of culturally significant resources and sites, and some cultural data points are intended to be representational and not precise. Therefore, the total number of cultural sites exposed to hazards is likely to be underrepresented

Built Environment

- Most heavily populated areas are exposed to high wildfire risk.
- Transportation: Bridges are particularly exposed to coastal hazards. Highways are exposed to SLR, landslide, and flooding
- Electricity: Direct damage and outages are possible during extreme events, as well as stress to the system during extreme heat events.
- Water and wastewater: a few wastewater treatment plants are exposed to SLR. Water and wastewater infrastructure are exposed to SLR and flood, which can cause contamination

Economy and Livelihoods

- Food security: reliance on imports and example of the effects of extreme events (2018 floods) on local agriculture
- Tourism: unprepared tourists particularly in transient vacation rentals, and overall strain of large numbers of tourists on infrastructure and other systems

Table 2. North Shore Hazard Exposures by Census Place

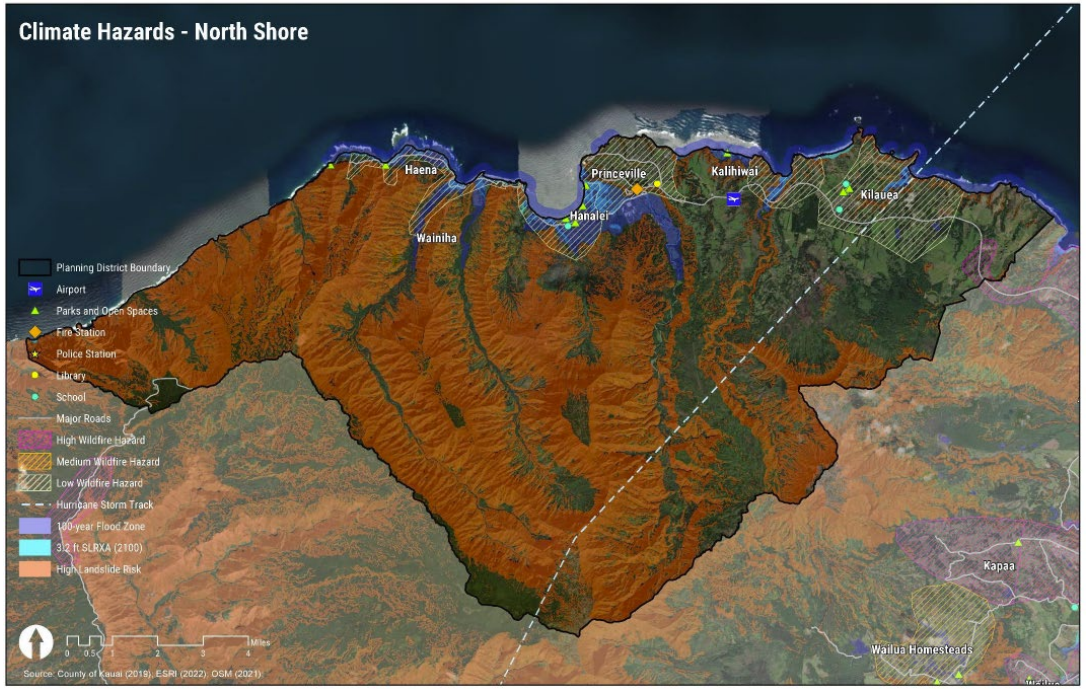
Community	Hazard Exposures
Kilauea	• The most densely urbanized neighborhood of Kilauea is exposed to low wildfire hazard. The area has a low-moderate SVI score (40-50th percentile) and includes one affordable housing development with 12 units. • The area directly adjacent to Kilauea stream is exposed to flooding, SLR, and some landslide. It is also in the tropical storm path. However, the area is mostly undeveloped. • The entirety of Kauapea Beach is exposed to SLR.
Kalihiwai	• Kalihiwai Beach and stream are exposed to SLR and flooding. Sections of Kalihiwai Road are within the SLR-XA. • Kalihiwai Bridge is exposed to flooding but it should not be impacted due to its high elevation over the stream. • The town has a high SVI score (80th percentile). • Anini is exposed to flooding and SLR. The area exposed to flood is directly adjacent to areas with high landslide risk. Anini Road is within the SLR-XA, and there are some residences that may be within the flood and landslide area.
Princeville	• All development in Princeville (primarily residential and visitor uses) is completely within the low wildfire hazard area. This includes one affordable housing development with 44 units. • Critical facilities in the area include fire station, post office, police station, and the KKCR Radio facility,
Hanalei	• The entire town (developed with residential, commercial, and agricultural uses) is exposed to flooding between the Waiʻoli Stream and Hanalei River. The areas of flooding are immediately adjacent to high landslide risk, including at multiple points along Kuhio Highway. • The more developed portion of the town has a moderate-high SVI score (60-70th percentile), and the agricultural areas have a moderate-high score (70-80th percentile) • The bridge over Waiʻoli Stream is exposed to multiple hazards: low wildfire risk, 1% chance annual flood, landslide, SLRXA-1.1 (passive flooding), SLRXA 3.2 (passive flooding), and NOAA 6 ft SLR projected coastal flooding. • The elementary school, post office, and neighborhood center are exposed to low wildfire hazard and flood. • Residential and agricultural lands from Black Pot Beach to Kuhio Highway are exposed to SLR.
Haʻena	• The entire town (primarily residential development) is exposed to flooding. It has a moderate-high SVI score (70-80th percentile) • The town's entire coast is exposed to SLR-XA, but it is most prevalent around the YMCA camp and at Wainiha Beach Park. • Kuhio Highway is exposed to landslide, SLR, and flooding between Wainiha Bay Park and Beach Park.

Table 3. Summary of Assets Exposed to Hazard in North Shore

Asset	Fire Risk (H-High, M-Med, L-Low)	FEMA 1% Chance Annual Flood	Landslide	SLRXA-1.1 (2050)	Passive Coastal Flooding (2050)	High Wave Flooding (2050)	Coastal Erosion (2050)	SLRXA-3.2 (2100)	Passive Coastal Flooding (2100)	High Wave Flooding (2100)	Coastal Erosion (2100)	NOAA 6 ft SLR (2100)
Point Features												
Critical Facilities	4 (H) 57 (L)	16	11	2	2	0	0	8	4	5	0	9
Buildings	116 (H) 4,513 (L)	1,038	64	75	1	54	10	279	20	216	83	280
Affordable Housing Developments	2 (L)	0	0	0	0	0	0	0	0	0	0	0
Bridges	13 (L)	10	0	7	5	1	0	9	9	5	1	10
Bus Stops	8 (L)	3	0	0	0	0	0	0	0	0	0	0
Hotels and Rentals	90 (L)	35	2	3	0	2	1	11	1	11	2	8
Cultural Features[1]	2 (H) 47 (L)	37	43	7	4	5	1	8	4	6	3	10
Fish Ponds	1 (L)	1	0	0	0	0	0	0	0	0	0	1
Acres												
Coral Reefs[2]	0	1,004	0	0	-	-	-	392	-	-	-	996
Parks	0	0	0	0	-	-	-	0	-	-	-	0
Existing Agricultural LU	213 (L)	192	2,295	5	-	-	-	5	-	-	-	146

Data from the master asset spreadsheets is summarized by planning area in the report.

Figure 11. Climate Hazards - North Shore



Any overall reactions or comments before the breakout rooms?

Breakout Rooms

TAG Ground Rules

- Share from our own knowledge and experiences
- Allow other voices to be heard (don’t dominate the discussion)
- Respect everyone's opinions and ideas
- Agree to disagree if needed
- Mute when not speaking
- Raise virtual hand to speak
- Keep camera on if possible

Breakout Room Format / Instructions

Now we want to hear from you! We need your expertise to add to our analysis in the following areas:

1. **Socially Vulnerable Populations**
2. **Natural and Cultural Resources**
3. **Built Environment, Livelihoods, and Economy**

You can go to different rooms throughout the discussion period or stay in one the whole time. It is up to you!

Zoom Controls

1. Click **Breakout Rooms**  in your meeting controls.
   This will display the list of open breakout rooms created by the host.
2. Hover your pointer over the number to the right of breakout room you wish to join, click **Join**, then confirm by clicking **Join**.
3. Repeat as necessary to join other breakout rooms, or click **Leave Room** to return to the main session.

* If you do not see the Breakout Room symbol or cannot select one, type in the chat which room you want to go to. Hosts can move you manually

Miro Controls

Use to click on an existing post-it and start typing

Use to add more post-its

Use to leave a comment at a specific point, e.g. on a map

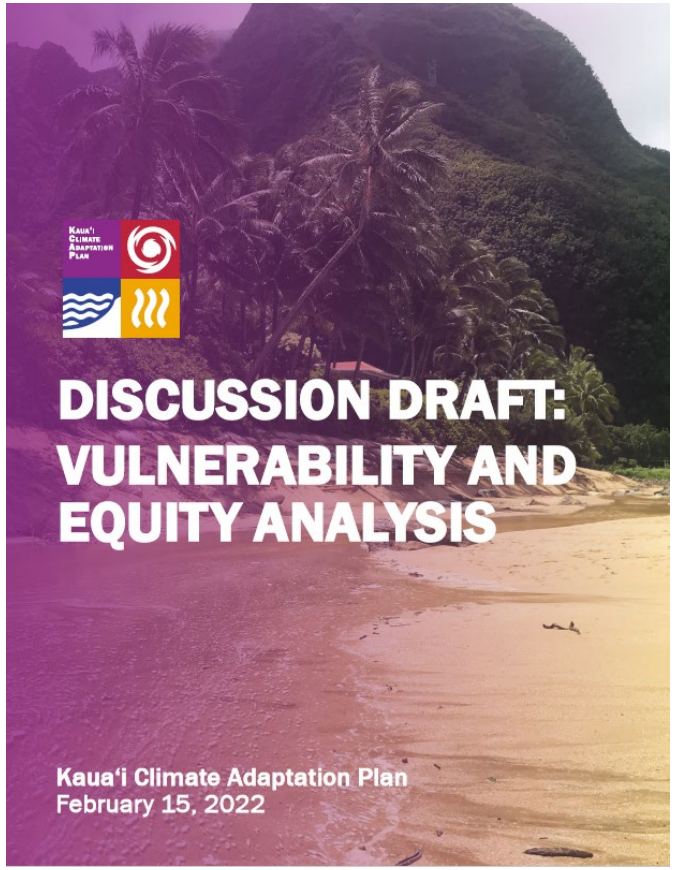
To move around the board:

- Select the arrow button
- Hold spacebar while using the arrow to pan OR hold right click of using a mouse (symbol will change to a hand)
- Zoom using the + and – in the bottom right corner or on your keyboard

A Look Ahead

Vulnerability and Equity Analysis Comments

Please upload your comments to the folder in the SharePoint or send to Ruby by March 2nd.



Upcoming Engagement

Please attend our public outreach events! Invite your family, friends and community members!

- Virtual Open House: March 23
- In-person Open Houses:
  - March 25, Kekaha Neighborhood Center
  - March 26, Poʻipū Beach Pavillion
  - April 2, Kukui Grove Center
  - April 5, Kapaʻa Neighborhood Center
  - North Shore Open House TBD

Visioning & Strategy Development

Vision

- Prepare a vision statement for the Kauaʻi Climate Adaptation Plan based on the General Plan vision and community engagement

Strategy and Action Development

- Create a framework that adapts strategies and tools to the island-wide and community-specific vulnerabilities identified in the Technical Work

Funding and Financing Development

- A matrix of funding and financing options for the proposed Kauaʻi Climate Adaptation Plan


Kaua'i
Climate
Adaptation
Plan
MAHALO!