

A scenic landscape featuring green hills, a body of water, and a distant island under a blue sky with scattered clouds.

# A Climate Adaptation Approach to One Water Honolulu's CIP

October 15, 2025

HWWA ANNUAL CONFERENCE

Rachel Duncan and Tess Sprague





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# Project Overview



# One Water Honolulu Project Team

## Team Members



**Susan Mukai, PE**  
PROJECT MANAGER  
smukai@brwncald.com



**Cari Ishida, PhD, PE, ENV SP**  
PROJECT MANAGER  
cishida@carollo.com



**Dean Nakano**  
PROJECT OVERSIGHT



**Lenise Marrero, PE**  
ONE WATER SUBJECT  
MATTER EXPERT



**Tess Sprague, PhD**  
CLIMATE AND RESILIENCE  
SUBJECT MATTER EXPERT



**Wendy Broley, PE**  
TECHNICAL ADVISOR



**Tyler Oshiro, PE**  
PROJECT ENGINEER



**Rachel Duncan, ENV SP**  
SENIOR ENGINEER



**Inge Wiersema, PE**  
TECHNICAL ADVISOR



**Sunshine Saucedo, EIT**  
PROJECT ENGINEER



**Seema Chavan, PE**  
FUNDING SUBJECT MATTER EXPERT



**Cami Kloster**  
G70

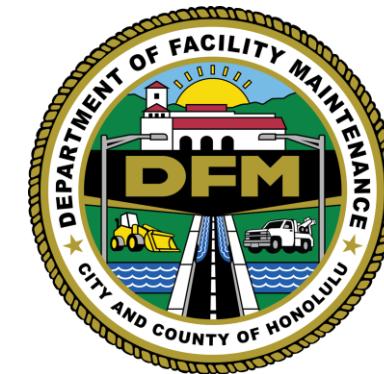


**Ian Monahan**  
KATZ & ASSOCIATES

● Brown and Caldwell ● Carollo ● Subconsultants

# One Water Panel

The One Water Panel includes, but is not limited to, representatives from 8 City departments



# OWH Technical Advisory Committee

Purpose: Provide input and guidance on the One Water Honolulu project's methodology, project development, and coordination between City and State efforts.

## TAC Members:

- **Dr. Chip Fletcher**, UH SOEST
- **Dr. Victoria Keener**, ASU & East-West Center
- **Genevieve Sullivan**, State DOT, Highways Div
- **Joanna Seto**, State of Hawaii Department of Health
- **Wendy Meguro**, UH School of Architecture
- **Neal Fujii**, CWRM (recently retired; new TAC member TBD)
- **Mary Alice Evans**, State Office of Planning and Sustainable Development
- **Dr. Bradley Romine**, Pacific Islands Climate Adaptation Science Center, UH Sea Grant

# Climate Ready O‘ahu Vision Statement

A *Climate Ready O‘ahu* is one where:



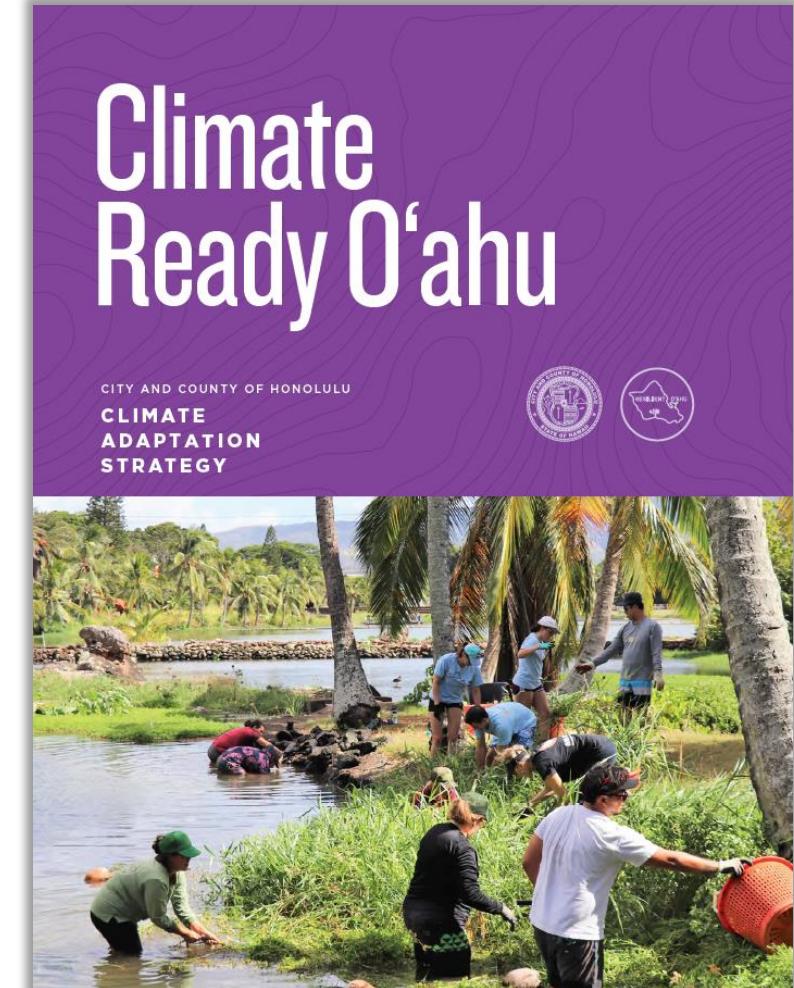
*All people are empowered* with the knowledge, tools, and resources to prepare for climate impacts;



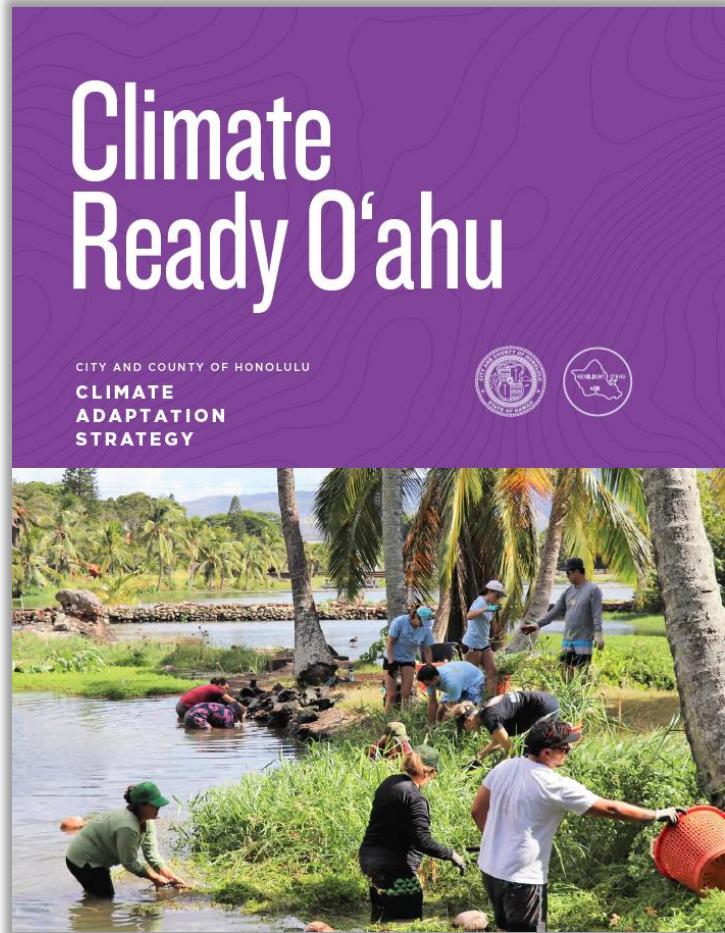
Connections between people and native ecosystems are cultivated so the *‘āina is safeguarded for generations* to come; and



*Infrastructure works with natural systems to keep residents safe* from climate hazards at home, at work, and everywhere in between.



# Building from Climate Ready O‘ahu



# OWH Project

- **Vision:** Collaborating for a thriving and climate resilient O‘ahu
- **Mission:** One Water Honolulu champions cost-effective and climate-resilient infrastructure services and natural systems for the people, culture, and sustainability of O‘ahu through integration and innovation in planning, implementation, and maintenance.



# Collaboration and Climate Change Adaptation Frameworks

## Collaboration Framework:

- Provides a clear and effective process of **who should be working together and how to build resilience** into the ongoing and planned projects, programs, and policies related to water management.

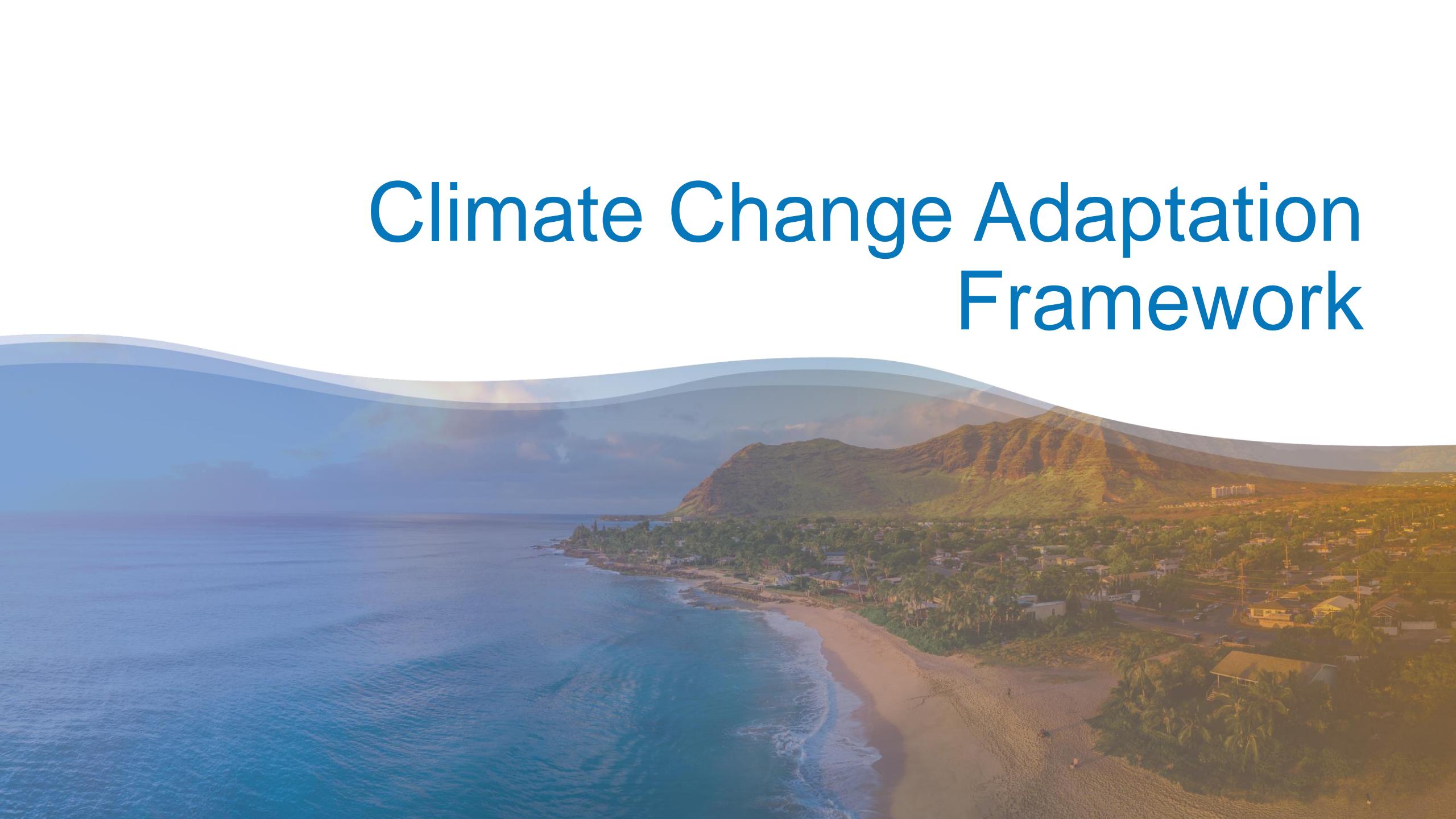
## Climate Change Adaptation Framework:

- Represents the **approach for determining vulnerabilities and adaptation strategies** (based on water infrastructure type and climate risk) and **their prioritization**.

## OWH Plan Outcomes

- Frameworks support: One Water CIP, Funding Strategy, Trigger-based Implementation Plan, Policies and Recommendations, and Private Sector Guidelines

# Climate Change Adaptation Framework

A wide-angle aerial photograph of a coastal town, likely in Hawaii, featuring a large, rugged mountain with distinct ridges in the background. The town is built along a sandy beach, with numerous houses, palm trees, and roads. The ocean is visible to the left, with waves crashing onto the shore. A large, semi-transparent blue banner is overlaid on the top half of the image, containing the title text.

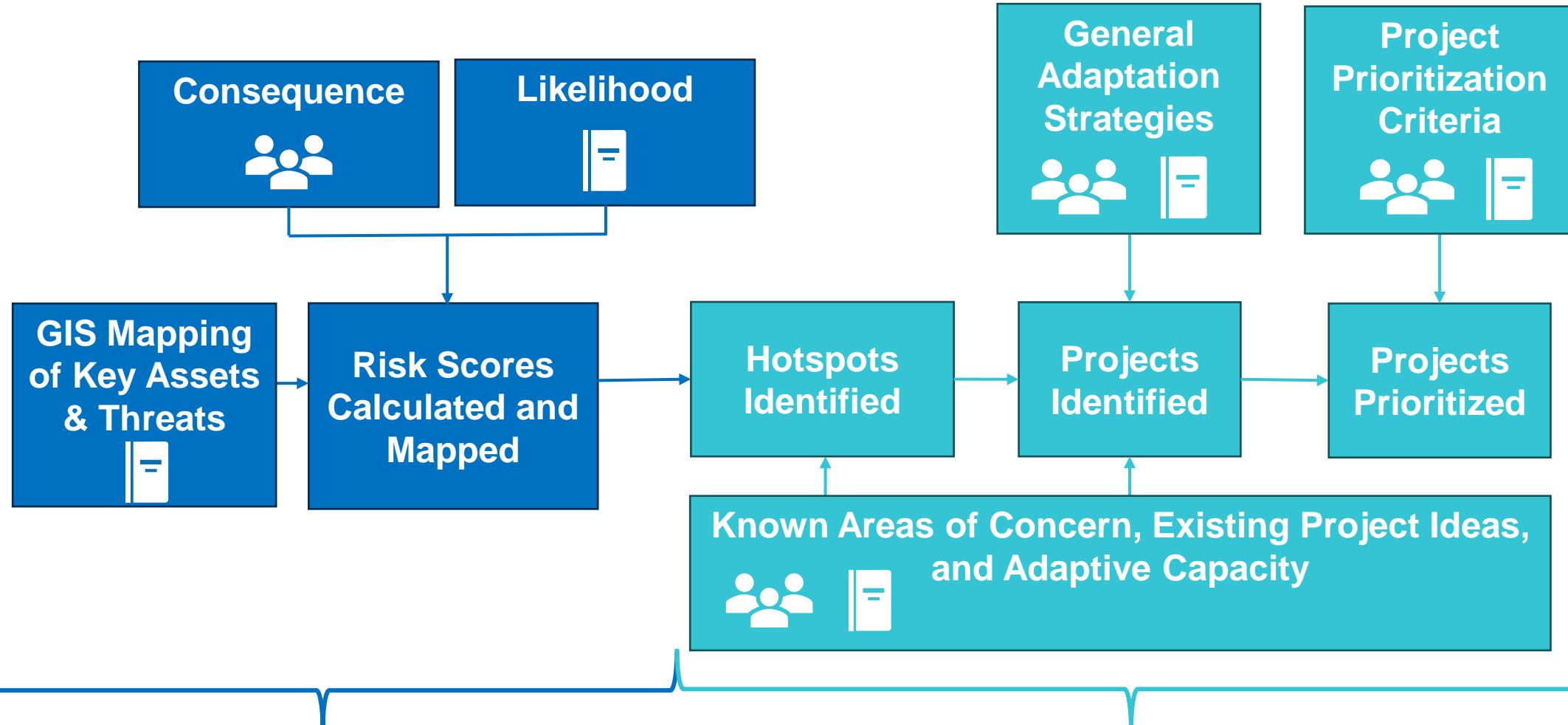
# Climate Change Adaptation Framework



Collaboration framework questions and information used to drive decision making



Input from past planning efforts and document review, including stakeholder input



Part 1: Wide scope, low detail spatial assessment. Mostly automated  
Purpose: Screen thousands of threat-asset pairs to identify highest risk areas

Part 2: Focused scope, higher detail assessment. More manual  
Purpose: Develop and group prioritized list of projects to support phased CIP

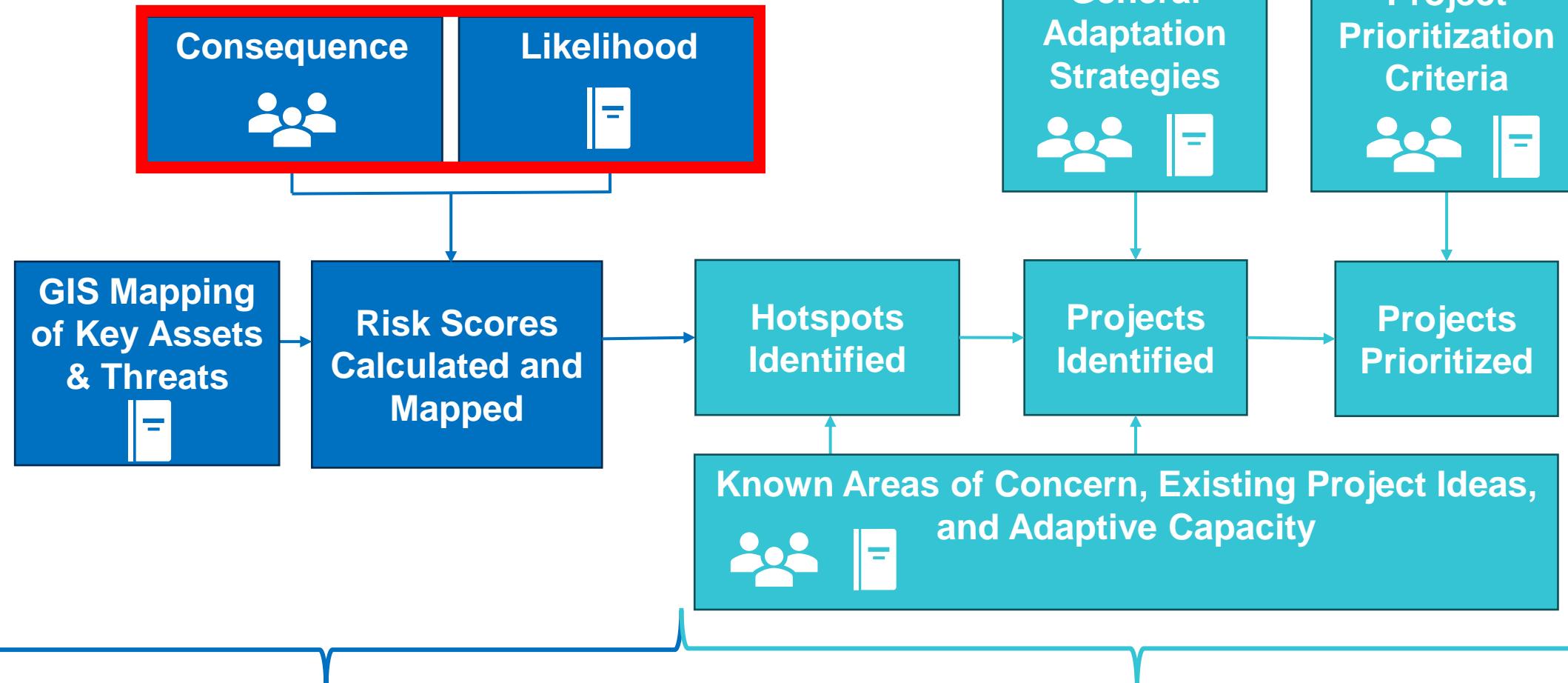
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$$\text{Risk} = \text{Consequence} \times \text{Likelihood}$$

**Risk Score** =

**Consequence Scores**

How badly a threat  
would impact an asset  
type



x

**Likelihood Scores**

Probability of a threat  
occurring in the  
planning horizon



# Likelihood Scores

Likelihood scale represented by percent chance of occurring over planning horizon

**0** = Asset not exposed to threat

**1** = Extremely unlikely, <5%

**2** = Unlikely, 5-33%

**3** = Possible, 33-66%

**4** = Likely, 66-95%

**5** = Extremely likely, >95%

Threat	Score (2055)	Score (2100)	Source	
SLR & Coastal Erosion – 1 ft	5	5	National Oceanic and Atmospheric Administration (NOAA) likelihood by scenario	
SLR & Coastal Erosion – 3 ft	3	4		
SLR & Coastal Erosion – 8 ft	1	1		
Hurricane - Category 1	3	5	American Water Works Association (AWWA) J100 Historical Record + Projected Climate Change Increase	
Hurricane - Category 2	3	5		
Hurricane - Category 3	1	1		
Hurricane - Category 4	1	1		
Tsunami Evac Zone	5	5	Historical Record	
Extreme Tsunami Evac Zone	1	1		
100 Year Storm	3	4	AWWA J100 Historical Record + Projected Climate Change Increase	
Wildfire – Low Risk	2	2		
Wildfire – Medium Risk	3	3	Qualitative	
Wildfire – High Risk	4	4		
Drought – Low Risk	5	5	Department of Land and Natural Resources (DLNR) Drought Risk and Vulnerability Assessment	
Drought – Medium Risk	5	5		
Drought – High Risk	4	5		
Extreme Heat – 2019 > 90	5	5	Historical Record + Projected Climate Change Increase	
Extreme Heat – 2019 > 85	3	4		

# Consequence Scores: Input from One Water Panel



Asset Type	Temporary Flooding (100 Year Storm, Hurricane, Tsunami)	Permanent Inundation from SLR (Overland)	Rising GW from SLR	Coastal Erosion	Wildfire	Extreme Heat
Slab-Mounted Equipment (Submersible Pumps, Injection Facilities, Wells)						
Building Facilities (Treatment Plants, Pump Stations, Base Yard)						
Pipelines						
Tanks						
Dams & Earthen Reservoirs						
Outfalls & Drains						

Asset Type	Temporary Flooding (100 Year Storm, Hurricane, Tsunami)	Permanent Inundation from SLR (Overland)	Rising GW from SLR	Coastal Erosion	Wildfire	Extreme Heat	DROUGHT
Slab-Mounted Equipment (Submersible Pumps, Injection Facilities, Wells)	●	●	●	●	●	●	
Building Facilities (Treatment Plants, Pump Stations, Base Yard)	●	●	●	●	●	●	
Pipelines	●	●	●	●	●	●	
Water Storage Tanks	●	●	●	●	●	●	
Dams & Earth Reservoirs	●	●	●	●	●	●	
Outfalls & Drains	●	●	●	●	●	●	
Roads & Bridges	●	●	●	●	●	●	

Asset Type	Temporary Flooding (100 Year Storm, Hurricane, Tsunami)	Permanent Inundation from SLR (Overland)	Rising GW from SLR	Coastal Erosion	Wildfire	Extreme Heat
Slab-Mounted Equipment (Submersible Pumps, Injection Facilities, Wells)	●	●	●	●	●	●
Building Facilities (Treatment Plants, Pump Stations, Base Yard)	●	●	●	●	●	●
Pipelines	●	●	●	●	●	●
Tanks	●	●	●	●	●	●
Dams & Earthen Reservoirs	●	●	●	●	●	●
Outfalls & Drains	●	●	●	●	●	●
Roads & Bridges	●	●	●	●	●	●

## Consequence Scale:

 = **Minimal**: Minimal or no impact to operations, little or no repair required

● = **Moderate**: Reduced operation, meaningful repair or some replacement needed

 = **Significant**: Complete failure or inoperable for a long period, significant or total replacement needed

# Consequence Scores: Translating Input into Consequence Scores

## Panel Input:



## Consequence Scores :

Asset Type	Temporary Flooding	SLR – Above Ground	SLR - GW	Coastal Erosion	Wildfire	Extreme Heat	Drought
Slab-Mounted Equipment	4	5	4	4	3	1	3
Building Facilities	4	5	3	4	3	2	2
Pipelines	2	4	4	4	3	2	1
Tanks	4	5	3	4	3	2	2
Dams & Earthen Reservoirs	5	4	1	4	4	3	2
Outfalls & Drains	5	5	3	5	2	1	1
Roads & Bridges	5	5	3	5	4	2	1

Note: Scores only applied to assets that have exposure to threat. If no exposure, risk = 0.

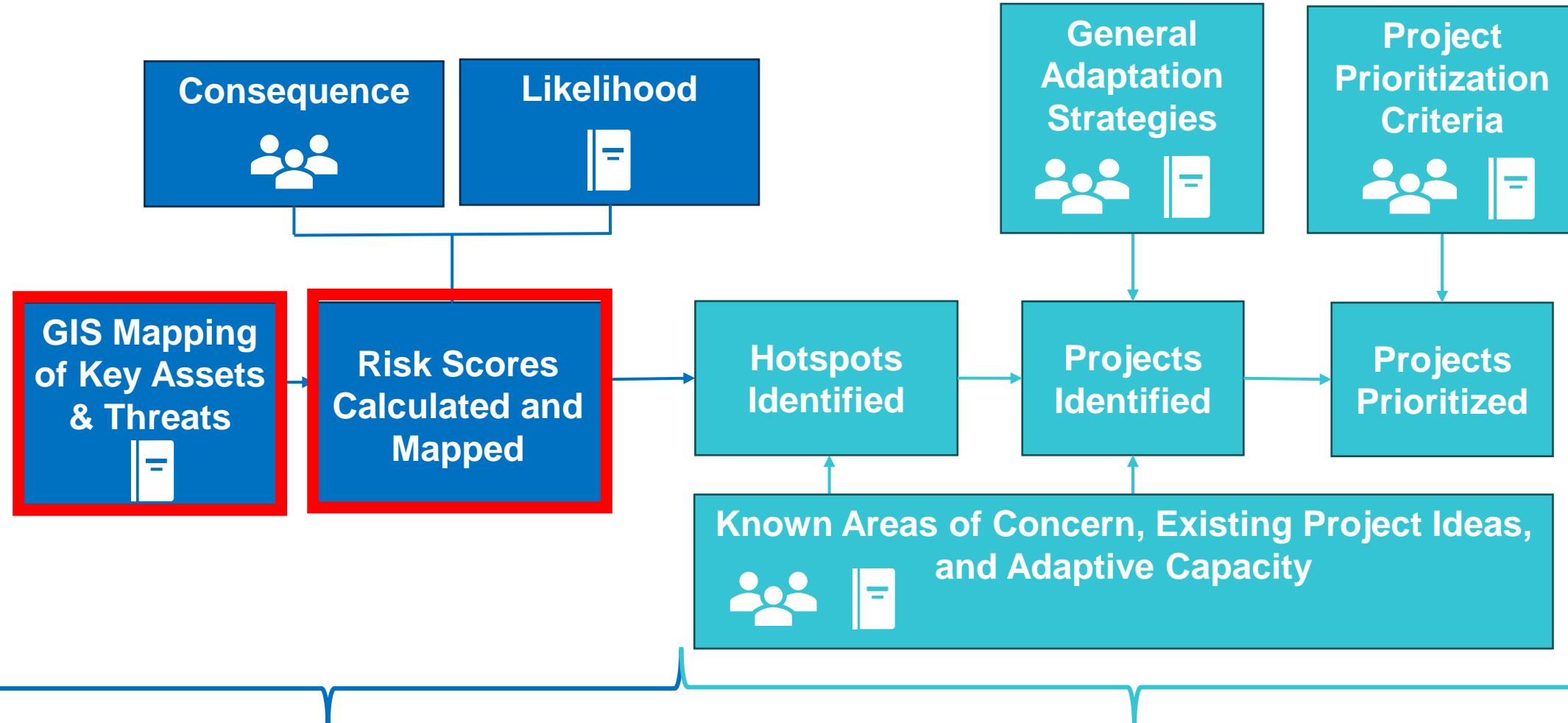
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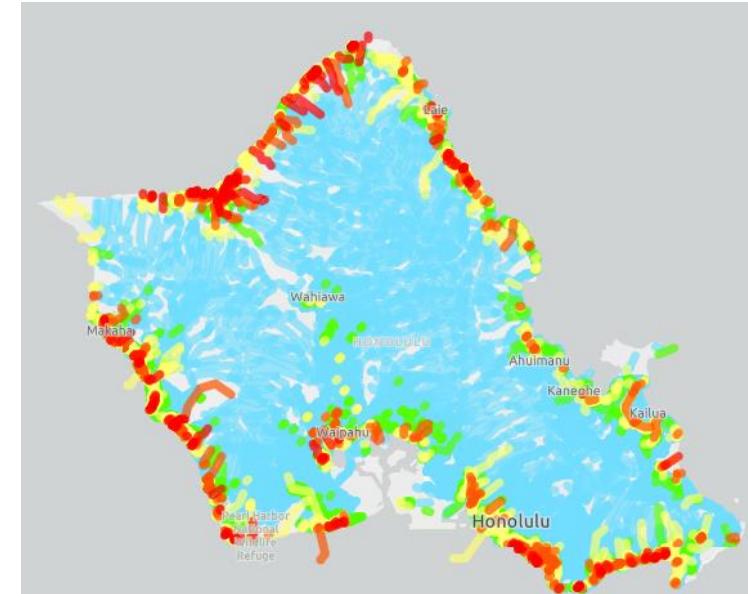
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# Infrastructure Risk Scores Calculated and Mapped

**Risk Score = Likelihood x Consequence**

Asset Type	Tsunami Evac Zones	Hurricane Surge Cat 2	100-yr Flood - VE	Coastal Erosion 1 ft	Drought Risk - Medium	Annual High-Wave Driven Flooding 1 FT	Ground Water Inundation 1 FT	Extreme Heat	Fire Risk - High	Total Risk
Major Streets	20	12	12	25	0	25	20	5	16	103
Major Streets	20	12	0	25	5	25	20	5	16	101
Major Streets	20	12	12	25	0	25	20	5	16	101
Major Streets	20	12	12	25	0	25	20	5	16	101
Major Streets	20	12	12	25	0	25	20	5	16	100
Major Streets	20	12	12	25	0	25	20	5	16	98
Major Streets	20	0	0	25	0	25	20	5	16	95
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Stormwater Conduits	20	12	12	20	5	25	15	5	8	94
Wells	20	12	0	0	0	25	25	6	0	94
Sewer PumpStation	20	0	0	20	5	25	20	10	16	94
Major Streets	20	0	0	25	0	25	20	5	16	93
Major Streets	20	0	12	25	0	25	20	5	16	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Major Streets	20	12	0	25	0	25	20	5	0	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Major Streets	20	0	12	25	0	25	20	3	16	93
Major Streets	20	0	12	25	0	25	20	3	16	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Major Streets	20	12	12	25	0	25	20	5	16	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Major Streets	20	12	12	25	0	25	20	5	0	93
Streams	20	12	12	15	5	20	15	5	12	92

	Very Low Risk	Low Risk	At Risk	High Risk	Very High Risk
Risk Score	<35	36-45	46-60	61-70	>70
# Assets	150K	60K	15K	4K	1K
% of Assets	66%	26%	6%	1.5%	0.5%



Note: Subset of climate threats shown for illustrative purposes

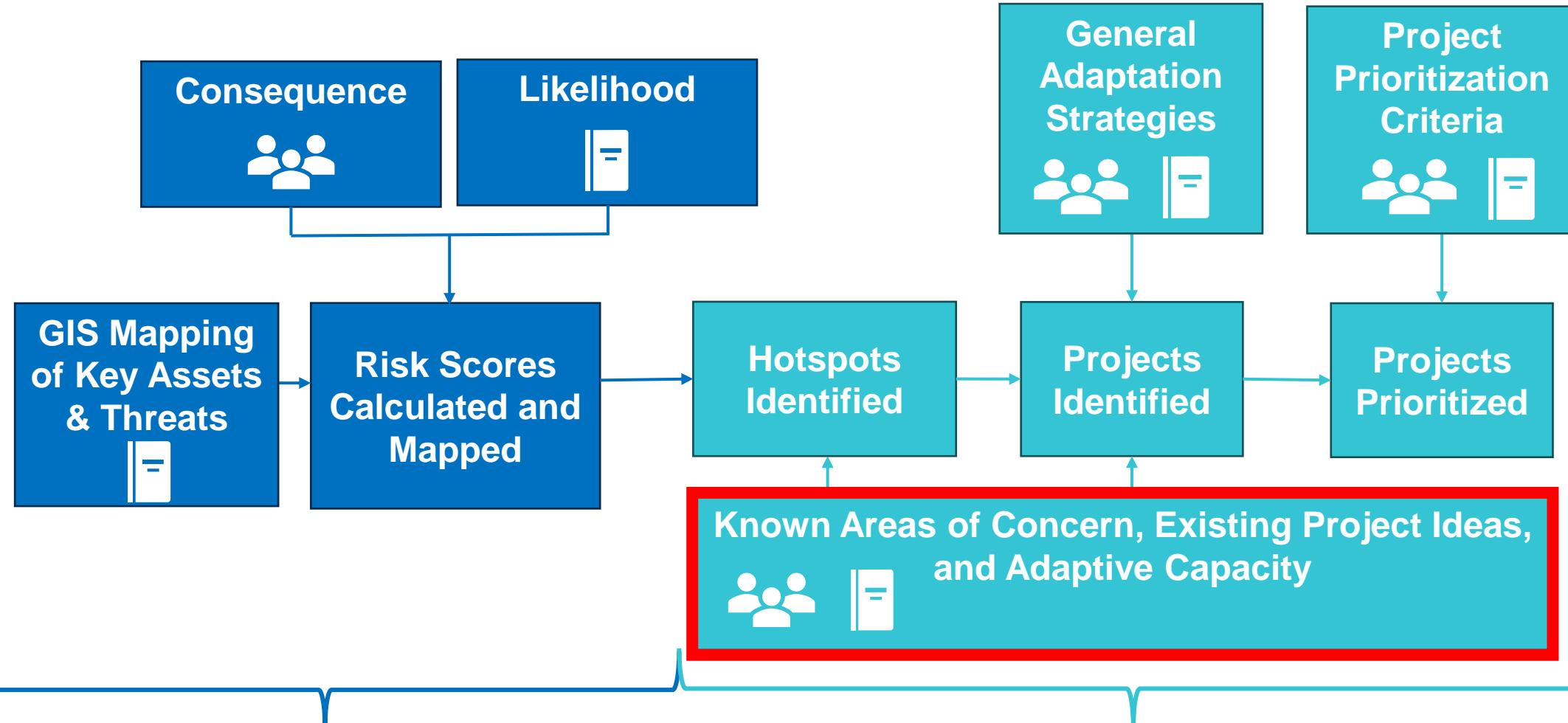
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# Plans, Policies, and Studies - Data Sources

 This helps us build from previous stakeholder engagement feedback!

Nearly 100 different documents compiled and reviewed to create a Digital Library

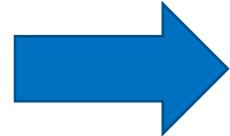
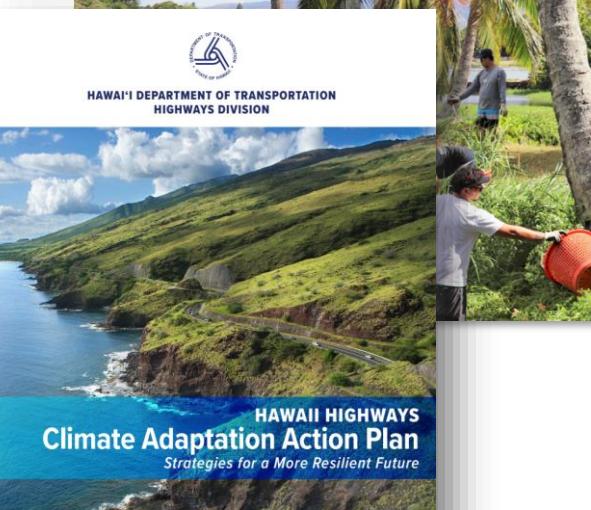
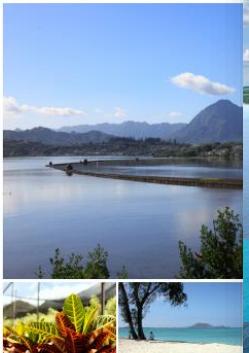
CITY AND COUNTY OF HONOLULU



Multi-Hazard Pre-Disaster Mitigation Plan for the City and County of Honolulu



KO'OLAU POKO SUSTAINABLE COMMUN



OWH Planning Documents List					
Last Revised: 10/1/2024					
Plan Name	Authoring Entity	Year	Link to Plan	Description	
Effects of Drought and Cloud-Water Interception on Groundwater Recharge and Wildfire Hazard for Recent and Future Climate Conditions, Kaua'i, 12 O'ahu, Moloka'i, Maui, and the Island of Hawai'i	USGS/Pacific Islands Climate Adaptation Science Center USGS/State of Hawai'i	2023	<a href="#">Effects of drought and cloud-water interception on groundwater recharge and wildfire hazard for recent and future climate conditions, Kaua'i, O'ahu, Moloka'i, Maui, and the Island of Hawai'i (usgs.gov)</a>	The report employs the Water-budget Accounting for Tropical Regions Model (WATRMod) to	
Estimated Groundwater Recharge for Mid-Century and End-of-Century Climate Projections, Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and the Island of 13 Hawai'i	Commission on Water Resource Management and the Pacific Islands Climate Adaptation Science Center and in collaboration with Pōlana Lāna'i Hawai'i (usgs.gov)	2023	<a href="#">Estimated groundwater recharge for mid-century and end-of-century climate projections, Kaua'i, O'ahu, Moloka'i, Lāna'i, Maui, and the Island of Hawai'i (usgs.gov)</a>	The document titled "Estimated Groundwater Recharge for Mid-Century and End-of-Century Climate Projections" provides projections for groundwater recharge across the state of Hawai'i under different climate scenarios.	
The City Storm Water BMP Guide for New and 14 Redevelopment	Honolulu, HI Code of Ordinances	2017	<a href="#">CHAPTER 16: BUILDING CODE (amlegal.com)</a>	Provides Storm Water BMP Design Guidelines for CCH DPP. These guidelines require the design and implementation of Best Management Practices (BMPs) to manage stormwater runoff and prevent flooding.	
Hawai'i Sea Level Rise Vulnerability and 15 Adaptation Report 2022 Update	Hawaii Climate Commission	2022	<a href="#">Sea-Level-Rise-Adaptation-and-Vulnerability-2022-Update_Final2-1.pdf</a>	Aim to address the threat posed by climate change to the economic well-being, public health, and safety of the state of Hawai'i.	
16 ROH Chapter 16 Building Code	Honolulu, HI Code of Ordinances	1990	<a href="#">CHAPTER 16: BUILDING CODE (amlegal.com)</a>	16-1.1 Hawaii State Building Code: The Hawaii State Building Code, as adopted by the State of Hawai'i.	
17 ROH Chapter 17 Electrical Code.	Honolulu, HI Code of Ordinances	1990	<a href="#">CHAPTER 17: ELECTRICAL CODE (amlegal.com)</a>	The State Electrical Code, as adopted with modifications the National Electrical Code (NEC).	
ROH Chapter 18A Grading, Soil Erosion, and 18 Sediment Control	Honolulu, HI Code of Ordinances	1990	<a href="#">CHAPTER 18A: GRADING, SOIL EROSION, AND SEDIMENT CONTROL (amlegal.com)</a>	18A-1.1 The purpose to provide standards to protect property and to promote the public health, safety, and welfare.	
19 ROH Chapter 19 Plumbing Code	Honolulu, HI Code of Ordinances	2018 (ad)	<a href="#">CHAPTER 19: PLUMBING CODE (amlegal.com)</a>	19-1.1 The Hawaii State Plumbing Code adopted by the State Building Code Council with	
20 City Rules Related to Water Quality	Honolulu Complete Streets Design Manual	2018	<a href="#">DPP Rules Relating to Water Quality (honolulu.gov)</a>	Provides water Design Guidelines and Requirements which is reviewed and approved by the City and County of Honolulu.	
Honolulu Complete Streets Design Manual	City and County of Honolulu	2016	<a href="#">160908 Honolulu Complete Streets Design Manual_Final.pdf</a>	This Manual provides guidance to plan and design streets that adhere to the legal framework.	
21 (September 2016).			<a href="#">CHAPTER 14: PUBLIC WORKS INFRASTRUCTURE (amlegal.com)</a>	Infrastructure Policy in the public ROW including landscaping, streets and sidewalks, curbs, and gutters.	
Revised Ordinance of Honolulu (ROH) Chapter 14	Honolulu, HI Code of Ordinances	1990	<a href="#">CHAPTER 21: LAND USE ORDINANCE (amlegal.com)</a>	This chapter, inclusive of any amendments, shall be known as the land use ordinance (LUO).	
22 Public Works Infrastructure	Honolulu, HI Code of Ordinances	1990	<a href="#">CHAPTER 21A: FLOOD HAZARD AREAS (amlegal.com)</a>	Within the City and County of Honolulu, certain areas are subject to periodic inundation by	
23 ROH Chapter 21 Land Use Ordinance	Honolulu, HI Code of Ordinances	1990			
24 ROH Chapter 21A Flood Hazards Areas	Honolulu, HI Code of Ordinances	1990			

# One Water Panel & Leadership Group Input



Collaboration and informational inputs across agencies

Input gather system specific experience from One Water Panel and Leadership Group via workshops and working group meetings.



THEMES	PROJECTS / OTHER
<ul style="list-style-type: none"><li>Vulnerable coastal areas and critical infrastructure</li><li>Beaches</li><li>Recreational areas</li><li>Kamehameha Hwy</li><li>Bridges</li><li>Lots of red dots!</li><li>Ingress/Egress for North Shore during emergencies</li><li>Both lack of water and too much water concerns</li></ul>	<ul style="list-style-type: none"><li>Managed retreat planning</li><li>Wahiawa Reservoir Spillway modification - Status unknown (Concern for dam failure)</li><li>Promotion of natural systems</li><li>Promotion of sustainable agriculture development</li><li>Variety of Vulnerabilities<ul style="list-style-type: none"><li>Drought + Wildfire</li><li>SLR, Coastal Erosion, Storm surge</li><li>Flooding</li></ul></li><li>Other Concerns<ul style="list-style-type: none"><li>Bridge failures</li><li>Water Quality</li><li>Groundwater recharge</li><li>Agriculture, pesticides, vegetation management</li><li>Displacement of nearshore communities</li><li>Invasive species</li></ul></li></ul>

Data (👤 + ⚒) synthesized for Regional Summaries for each Regional Planning District. These identified areas with...



City projects/current efforts

Flooding issues

Community isolation/roadway accessibility issues

Improvements/rehabilitation needs

Water quality issues

Ecological resources & cultural sites

# Known Areas of Concern

Primary Urban Center Development Plan Area Summary  
February 6, 2020

**Community Profile:**  
The Primary Urban Center (PUC) is Oahu's most densely developed region, housing the majority of the island's population and businesses. Much of the coastline was historically modified through land reclamation to support development, particularly **Waikiki**, which was constructed on drained wetlands. Current development trends in the PUC focus on infill, densification, and vertical construction, particularly in areas like **Kakaako**. Additionally, Transit-Oriented Development (TOD) associated with the rail system is promoting higher-density development, particularly in **Leilehua, Kalihi, and Kalihiwai**. The rainfall in this windward area varies from high at the northern end to very dry at the southern end. Popular nature-based recreational opportunities for locals and tourists include beaches and ocean sports, mountain hikes, and Kualoa Marsh.

**Threats/Opportunities:**

- **Hurricanes**
- **Sea level rise**
- **Pollution**
- **Climate change**
- **Outstanding natural areas**
- **Open space**
- **Soil**
- **Water**
- **Wildlife**
- **Protect**
- **Restore**
- **Recreational**
- **Protect**
- **Implement**
- **Invest in**

**Recommendations:**

- Protect
- Protect
- Implement
- Invest in

Ko'olau Poko Community Plan Area Summary  
February 6, 2020

**Community Profile:**  
Ko'olau Poko is a mix of rural agricultural communities (Waikoloa, Waikoloa Beach, Kokohead, and Waimea) and more developed residential/commercial communities (Ko'olau, Kokohead, Kalihiwai, and Kalihi). Ko'olau Poko also includes Marine Corps Base Hawaii in Ko'olau. The rainfall of this windward area varies from high at the northern end to very dry at the southern end. Popular nature-based recreational opportunities for locals and tourists include beaches and ocean sports, mountain hikes, and Kualoa Marsh.

**Threats/Opportunities:**

- **Initiative**
- **Climate change**
- **Sea level rise**
- **Pollution**
- **Climate change**
- **Protect**
- **Restore**
- **Recreational**
- **Protect**
- **Implement**
- **Invest in**

**East Honolulu Sustainable Community Plan Area Summary**  
February 6, 2020

**Community Profile:**  
East Honolulu consists primarily of residential communities, including Waialae (Iki, Waiupe, Aina Haina, Niu Valley, Kalihiwai, Waikiki, and Waikiki Kai), Portlock, and Kalihi Valley, with some supporting businesses. The area experiences a generally dry climate year-round, but development has exacerbated flooding impacts along local streams. **Maunalua Bay**, which spans the most developed portion of the coastline, is a popular recreational hub featuring a boat harbor, fishing areas, and canoe paddling launch sites.

**Threats/Opportunities:**

- Severe flooding in valleys and inadequate flood control in **Waiupe Stream**.
- Need for increased drainage, debris management, and flood control systems.
- Niu Valley
- **Waikiki Valley**
- **Waikiki Kai**
- **Waikiki Beach**
- **Geodome Ridge** (in Hau'ula) Koi Golf Course
- Threats to **Waikiki Stream** and rare species from urban pressures.
- Concerns about flooding, vegetation management and water resource management integration into climate adaptation strategies.
- High salinity levels in recycled water from East Honolulu Wastewater Treatment Plant effluent limit its use.
- Numerous cesspools pose contamination risks to groundwater and nearshore waters.
- Emergency shelters not hurricane-rated or climate change resilient.

**Recommendations:**

- Continued participation in the Army Corps of Engineers' **Waikiki Stream Flood Risk Management Study**.
- Construct improvements to the Sand Island Wastewater Treatment Plant area, serving Oahu to Niu Valley, to increase climate change resilience.
- Recycling and water conservation are emphasized to address the climate change impacts on water supplies.
- Improved outdated emergency shelters to effectively serve communities facing an increase in windstorms and hurricanes frequency and intensity.

**Current City Efforts to Date:**

- Proposed project to dredge **Waiupe Stream** from Kalaniana'ole Hwy to West Hind Bridge (DFM)
- Upgrades to the Sand Island Wastewater Treatment Plant (ENR)



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## East Honolulu

- 1) Existing projects/current City efforts:
  - Proposed project to dredge Waiupe Stream from Kalaniana'ole Hwy to West Hind Bridge (DFM)

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## East Honolulu

- 2) Missing any areas: Specific locations + water & infrastructure concerns
  - Waste management: Cesspools and Septic Tanks along shorelines and low areas (general)
  - Flooding/stormwater management:
    - Waiupe Stream drainage issues
    - Niu Valley, Kalihiwai Valley, and Hahaione Valley flooding during intense rainstorms
    - Kalihiwai Valley Ridge to Hau'ula Golf Course concrete channel directing heavy rainfall to Kalihiwai Inlet
    - Sedimentation in Maunalua Bay from steep hillsides

**See digital map**

Residential Development Plan Areas EAST HONOLULU



## Known Areas of Concern



## Regional Summaries (8)



## Working Group Meetings Feedback

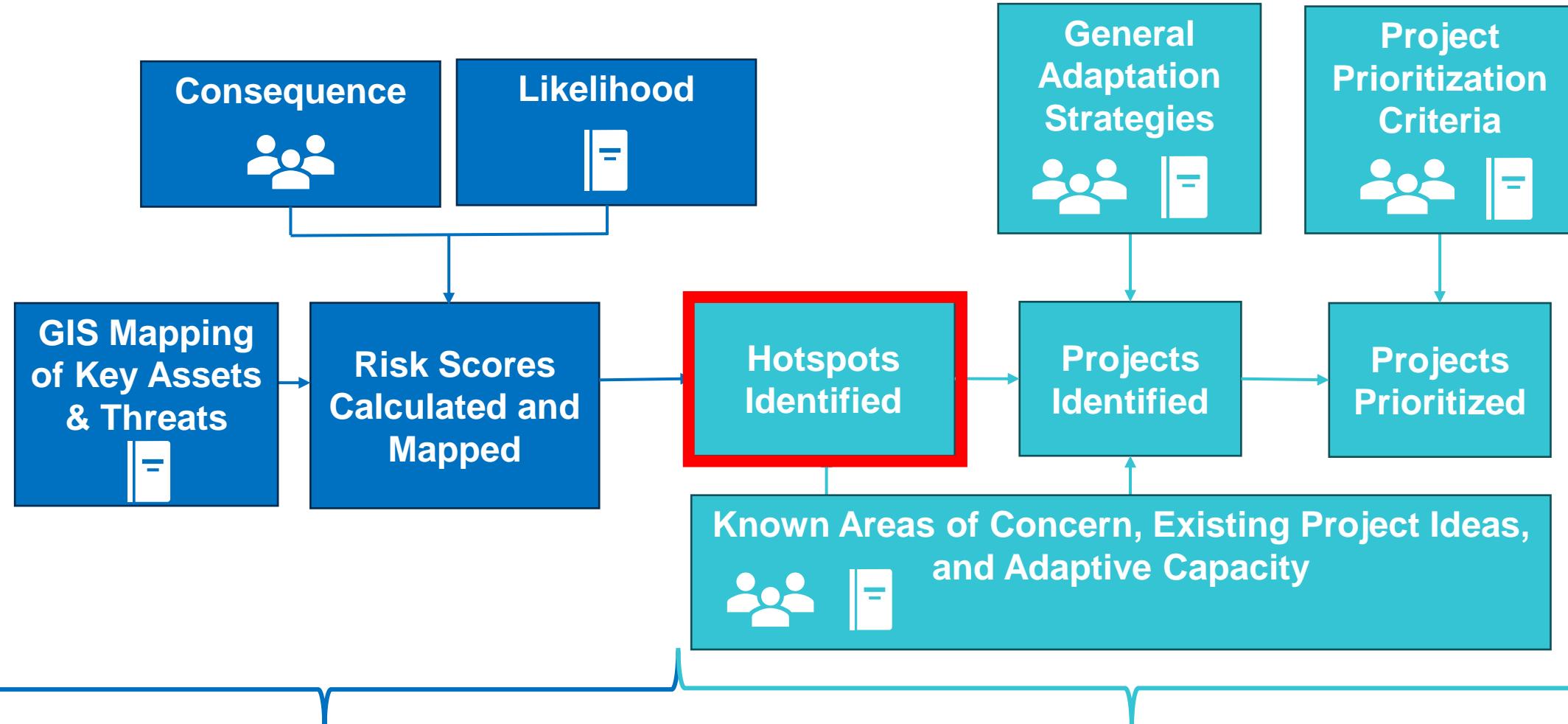
# Climate Change Adaptation Framework



Collaboration framework questions and information used to drive decision making

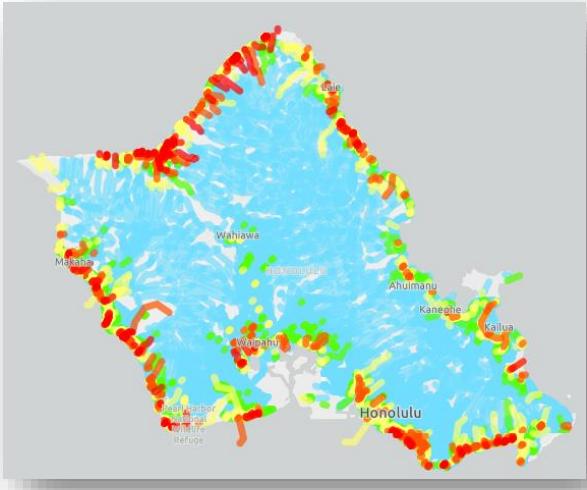


Input from past planning efforts and document review, including stakeholder input

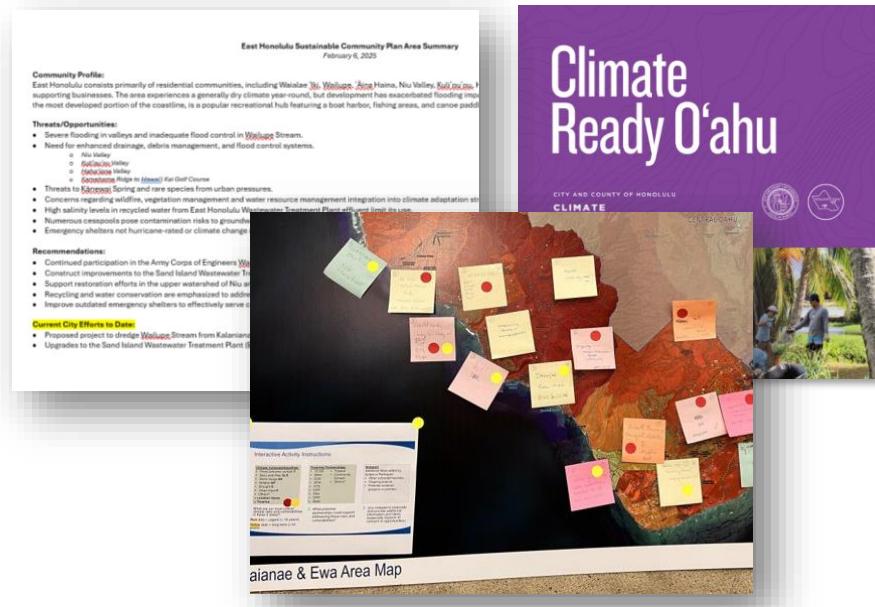


# How Did We Get from Data Gathering to Hotspot Identification?

## Risk Score Mapping



## Known Areas of Concern



**Community Profile:**  
East Honolulu consists primarily of residential communities, including Waialae, Waipahu, Aiea, Haina, Niu Valley, Kalihi, and Kalihiwai. The area is home to many businesses. The area experiences a generally dry climate year-round, but development has exacerbated flooding impacts in the most developed portion of the coastline, which is a popular recreational hub featuring a boat harbor, fishing areas, and canoe paddling.

**Threats/Opportunities:**

- Severe flooding in valleys and inadequate flood control in Waipahu Stream.
- Need for:
  - Alu Valley
  - Redondo Valley
  - Waipahu Valley
  - Waipahu River Head/Fall Line/Orme
  - Waipahu Stream
- Threats to rare plants and rare species from urban pressures.
- Concerns regarding wildlife, vegetation management and water resource management integration into climate adaptation plans.
- High salinity levels in recycled water from East Honolulu Wastewater Treatment Plant affect salt limit for use.
- Numerous cesspools pose contamination risks to groundwater.
- Emergency shelters not hurricane-rated or climate change ready.

**Recommendations:**

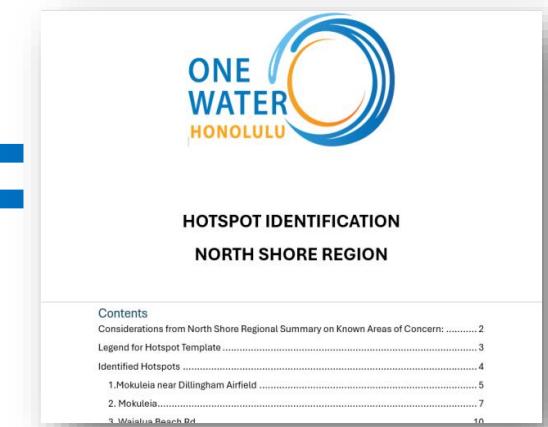
- Continued participation in the Army Corps of Engineers (ACOE) Flood Control Program.
- Considerations to the Sand Island Wastewater Treatment Plant.
- Support restoration efforts in the upper watershed of Niu and Waipahu streams.
- Recycling and water conservation are emphasized to address water scarcity.
- Improve outdated emergency shelters to effectively serve the community.

**Current City Efforts to Date:**

- Proposed project to dredge Waipahu Stream from Kalihiwai to the ocean.
- Upgrades to the Sand Island Wastewater Treatment Plant.

**aianae & Ewa Area Map**

## Hotspot Profiles



**ONE WATER HONOLULU**

**HOTSPOT IDENTIFICATION**  
**NORTH SHORE REGION**

**Contents**

Considerations from North Shore Regional Summary on Known Areas of Concern ..... 2  
Legend for Hotspot Template ..... 3  
Identified Hotspots ..... 4

1. Mokuleia near Dillingham Airfield ..... 5  
2. Mokuleia ..... 7  
3. Waialae Beach Rd ..... 10

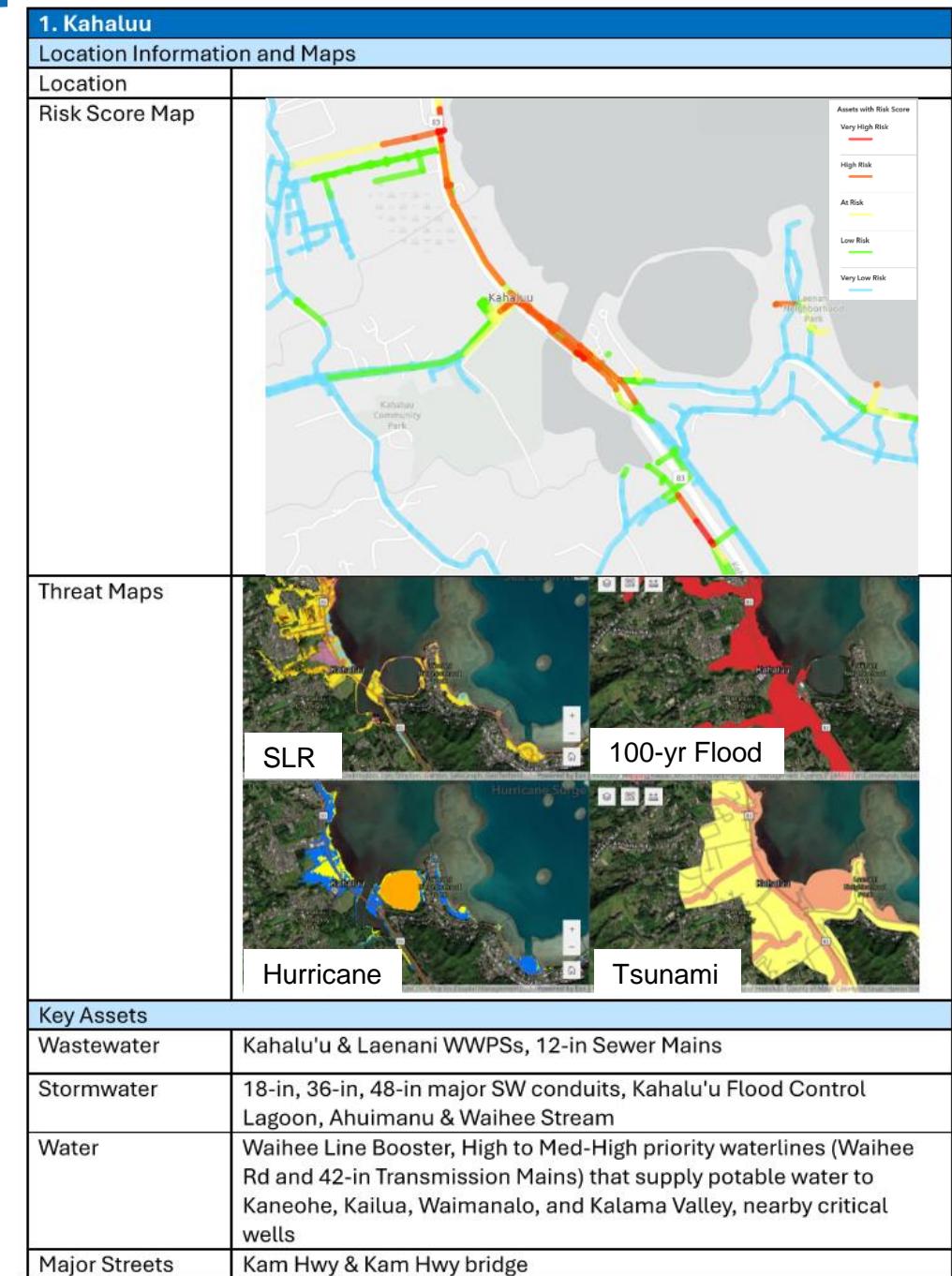
# Hotspot Profiles

Mapping  
Tool/Risk  
Screening  
Inputs

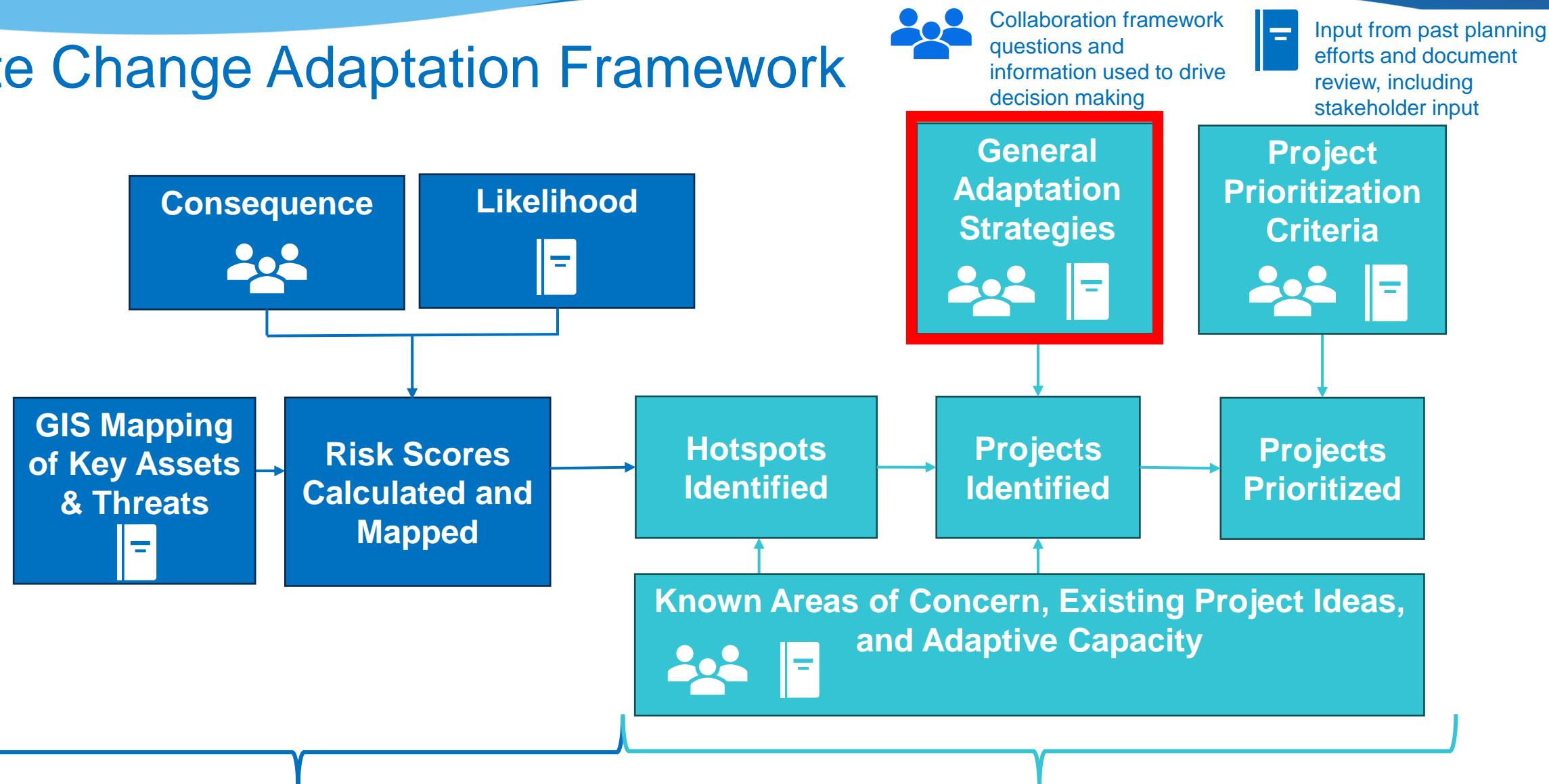
- Key Assets
- Climate Threats

Known Areas  
of Concern  
Inputs

- Community Assets
- Other Risks/Issues
- Ongoing/Planned Projects
- Potential Gaps

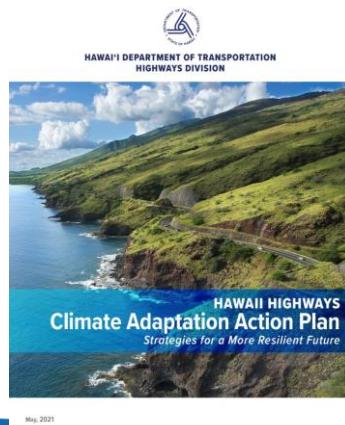
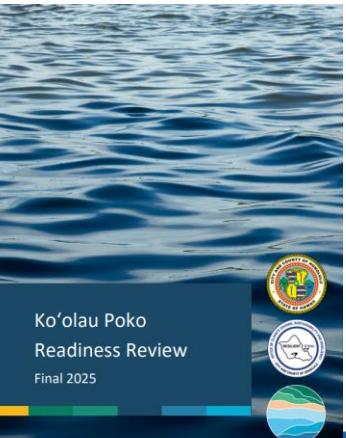
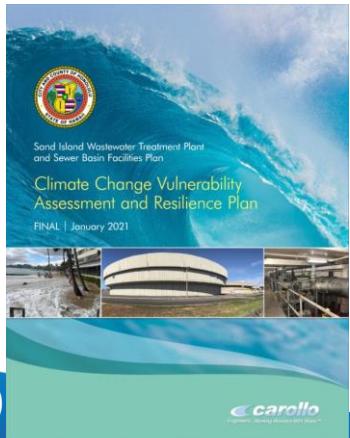
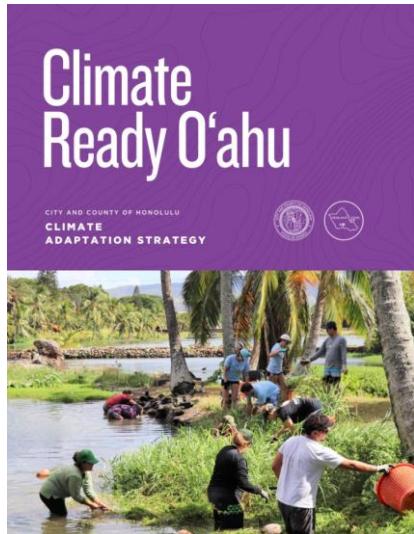


# Climate Change Adaptation Framework



# Adaptation Strategy Development

## Adaptation Strategy Sources

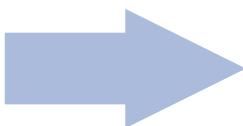


CITY AND COUNTY OF HONOLULU



Multi-Hazard Pre-Disaster Mitigation  
Plan for the  
City and County of Honolulu

Completed January 31, 2020  
Updated August 13, 2021



## Adaptation Strategy “Menu of Options”

Flood  
Barriers

Green  
Infrastructure

Elevate  
Infrastructure

Create  
Floodable  
Space

Alternative  
Water  
Supplies

... And Many  
More!

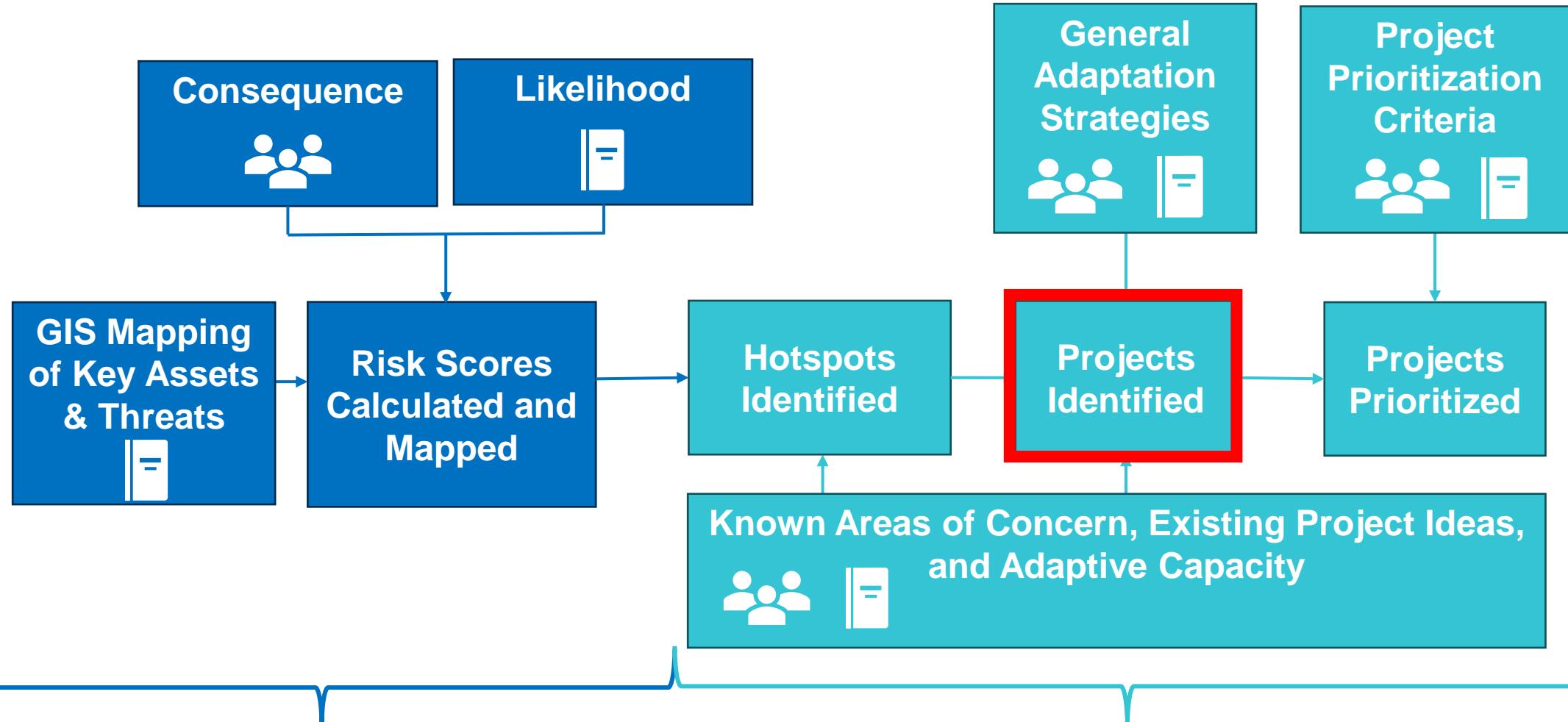
# Climate Change Adaptation Framework



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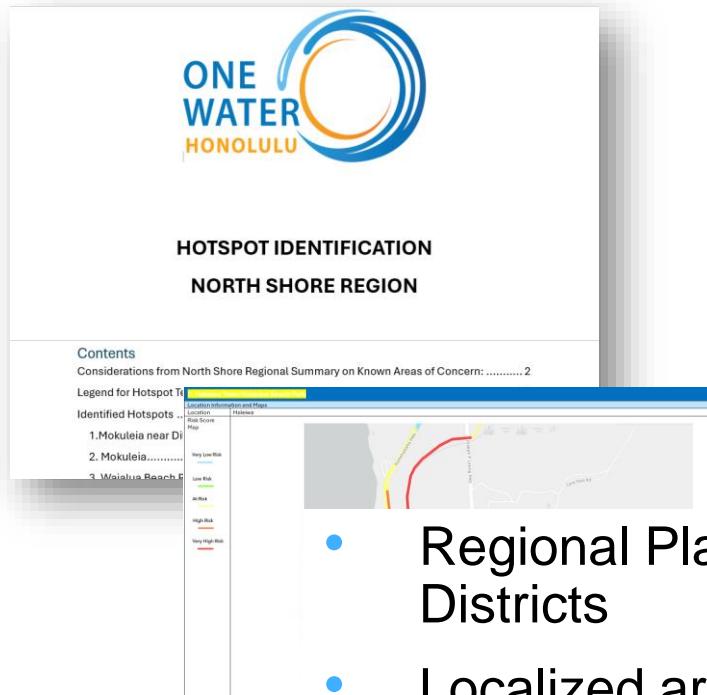


Part 1: Wide scope, low detail spatial assessment. Mostly automated  
Purpose: Screen thousands of threat-asset pairs to identify highest risk areas

Part 2: Focused scope, higher detail assessment. More manual  
Purpose: Develop and group prioritized list of projects to support phased CIP

# Applying Adaptation Strategies to Hotspots to Identify Projects

## Hotspots



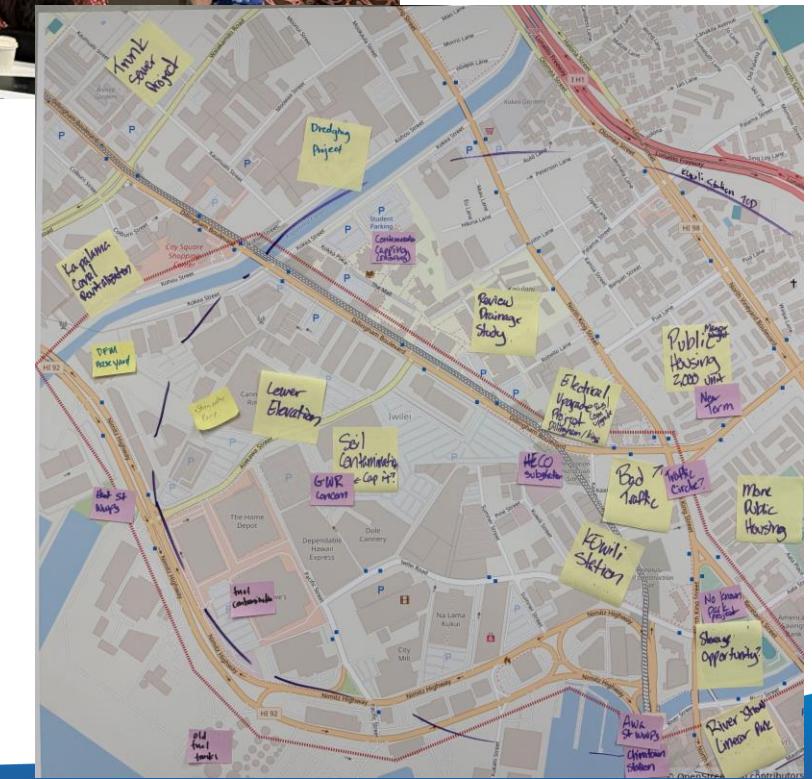
## Adaptation Strategies

Category	Type	Adaptation Strategy
Flood Barriers and Containment	Physical Infrastructure	Incorporate or Uplift Perimeter Floodwalls or Levees (e.g., barrier railing, raised feature, arthen levee, raised roadway, raised pathway), including
Flood Barriers and Containment	Physical Infrastructure	Incorporate Breakwaters (e.g., floating wave attenuator, aquatic habitat)
Flood Barriers and Containment	Physical Infrastructure	Raise Marine Structures (e.g., elevated wharf, pier)
Flood Barriers and Containment	Physical Infrastructure	Install Floodgates
Building and Asset Flood Protection	Physical Infrastructure	Add/Improve Floodgates to Stormwater Channels
Building and Asset Flood Protection	Programs	Deployable Flood Barriers (e.g., Sandbag Entrance and Opening)
Building and Asset Flood Protection	Physical Infrastructure	Dry Floodproof the Building/Asset/Utility (e.g., seal windows, doors, vents, drainage systems, manholes)
Building and Asset Flood Protection	Physical Infrastructure	Wet Floodproofing: Incorporate Flood Damage-Resistant Materials (e.g., concrete, brick, tiles, latex paint, pressure-treated plywood, cement, glass)
Building and Asset Flood Protection	Physical Infrastructure	Incorporate Flood/Submersible Pumps for Surface Water or Groundwater
Elevation of Infrastructure	Physical Infrastructure	Elevate Critical Assets/Equipment
Elevation of Infrastructure	Physical Infrastructure	Elevate Access Road and Associated Utilities
Elevation of Infrastructure	Physical Infrastructure	Elevate Site Grade
Elevation of Infrastructure	Physical Infrastructure	Uplift Existing Structures Above Flood Elevations (e.g., second floor)
Elevation of Infrastructure	Physical Infrastructure	Raise Building Ground Floor Elevation
Create Floodable Space	Programs	Conservation or Open Space Easement to Provide Floodable Space
Create Floodable Space	Programs	Agricultural Practices (Kalo Farming)
Green/Gray/Blue Stormwater Infrastructure	Physical Infrastructure	Modify Site Drainage, Storage, and Infiltration
Green/Gray/Blue Stormwater Infrastructure	Physical Infrastructure	Implement Low Impact Design (LID)/Green Infrastructure Stormwater Management Strategies
Green/Gray/Blue Stormwater Infrastructure	Physical Infrastructure	Daylight On-Site Stream/Drainage - restoring streams and drainage to be aboveground
Green/Gray/Blue Stormwater Infrastructure	Plans & Studies	Drainage System Plan
Green/Gray/Blue Stormwater Infrastructure	Physical Infrastructure	Incorporate Green Roof Design
Green/Gray/Blue Stormwater Infrastructure	Programs	Implement Water Flow Prevention Devices (e.g., tidal gates, check valves)
Green/Gray/Blue Stormwater Infrastructure	Plans & Studies	Incorporate a Downspout Disconnection Program
Coastal and Shoreline Resilience	Physical Infrastructure	Debris Management Plans and Systems
Coastal and Shoreline Resilience	Physical Infrastructure	Reef Facilitation
Coastal and Shoreline Resilience	Physical Infrastructure	Breakwater/Rewetments
Increase System Capacity	Physical Infrastructure	Restore Beach, Dune Systems, and Coastal Floodplain
Increase System Capacity	Plans & Studies	Infiltration and Inflow Study
Increase System Capacity	Physical Infrastructure	Upsize Pumping Capacity
Heat Management and Cool Infrastructure	Physical Infrastructure	Upsize Stormwater Drainage Capacity or Sanitary Sewer Capacity
Heat Management and Cool Infrastructure	Physical Infrastructure	Implement Cool Pavements (Additional Pavements for Roads and Sidewalks)
Heat Management and Cool Infrastructure	Physical Infrastructure	Select Solar Reflective Index Appropriate Roof ("Cool Roof") Designs
Heat Management and Cool Infrastructure	Physical Infrastructure	Incorporate Heat Resilient Materials
Heat Management and Cool Infrastructure	Physical Infrastructure	Incorporate Shade and Cooling Structures
Heat Management and Cool Infrastructure	Physical Infrastructure	Incorporate Ductless Color Conditioning and Ventilation Systems

- Regional Planning Districts
- Localized areas (e.g., communities, roads, clusters of assets)
- Plans and Studies
- Physical Infrastructure
- Programs

50 Projects  
for  
One Water  
CIP

# First Project Development Workshop – Oct 14<sup>th</sup>



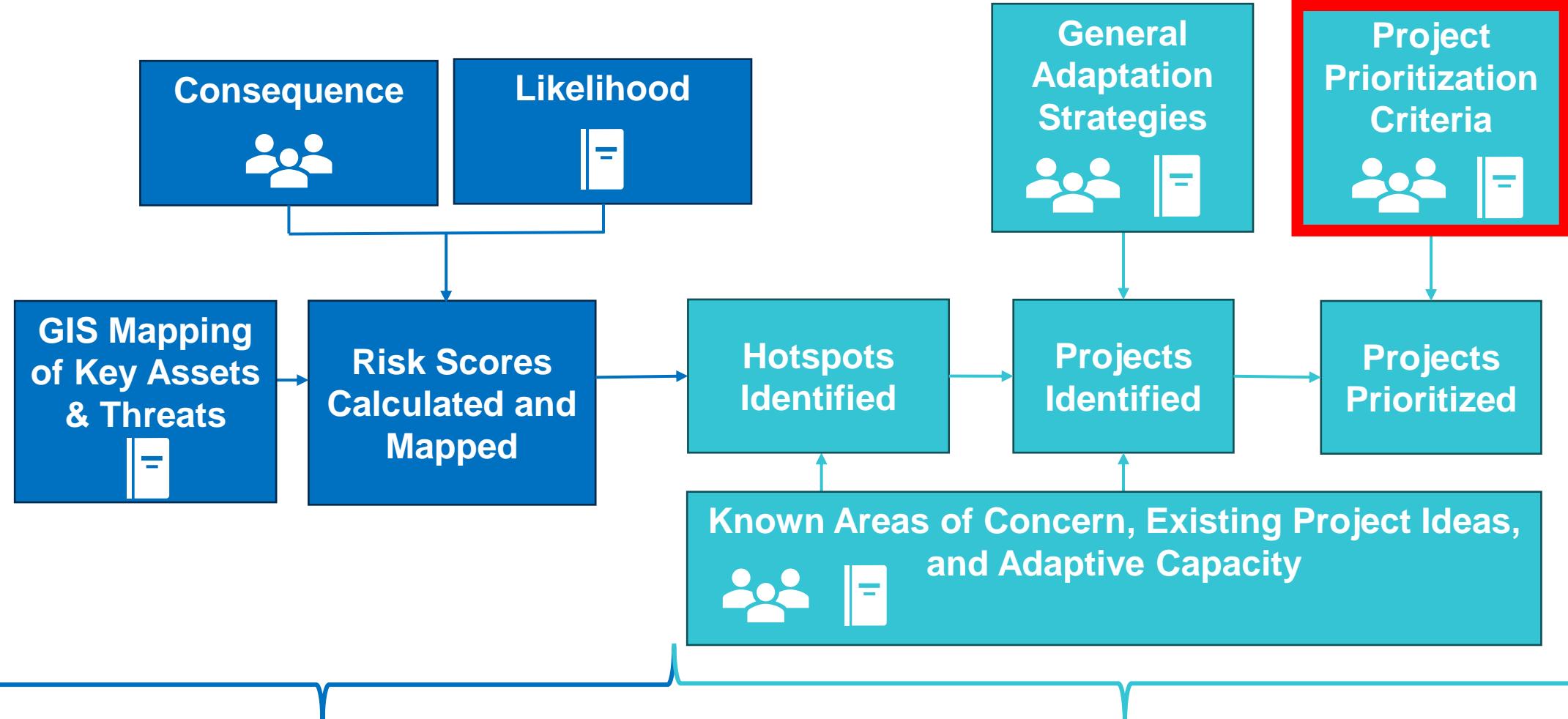
# Climate Change Adaptation Framework



Collaboration framework questions and information used to drive decision making



Input from past planning efforts and document review, including stakeholder input



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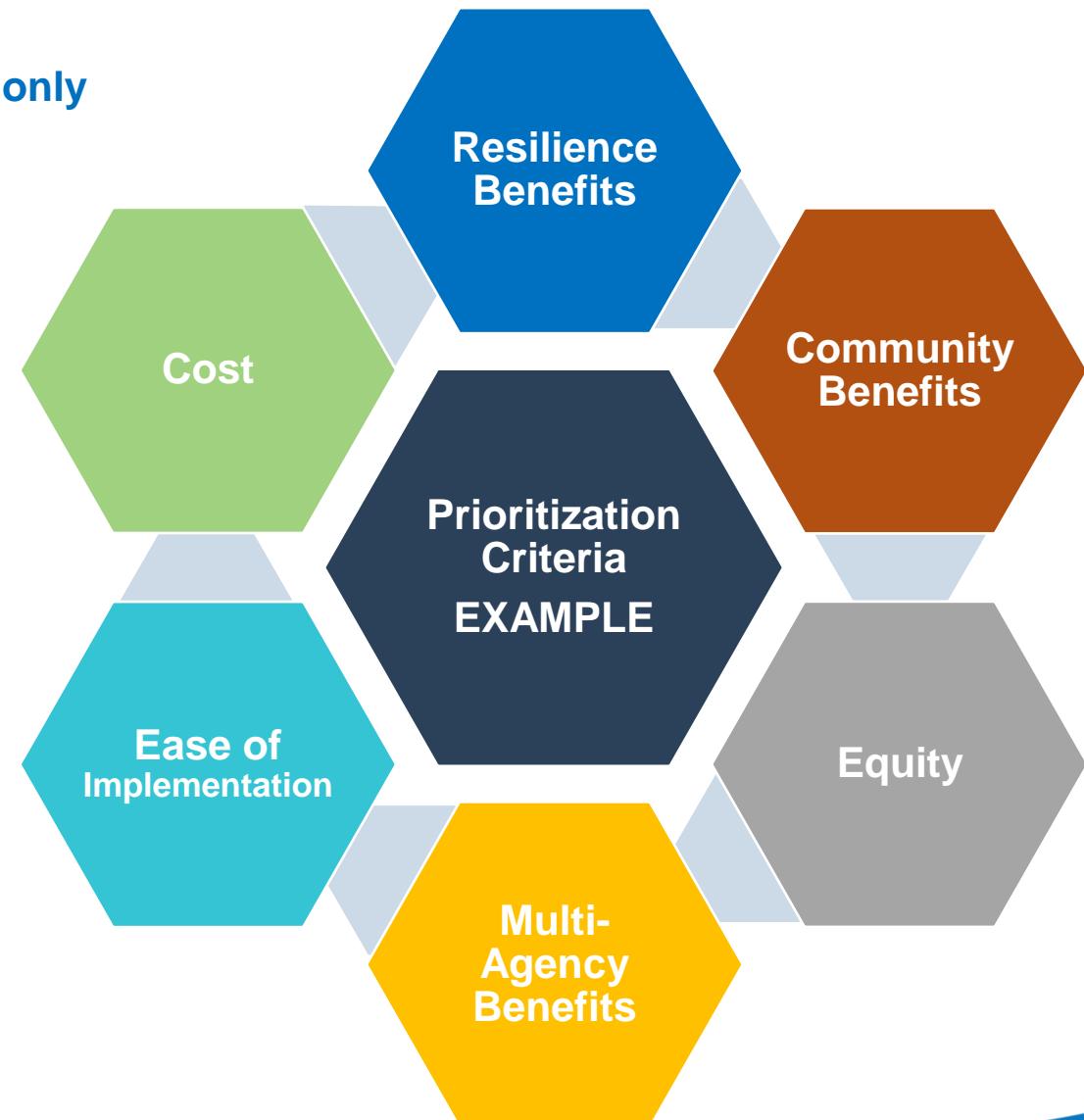
# Prioritization Criteria

Example criteria are shown here for demonstration purposes only

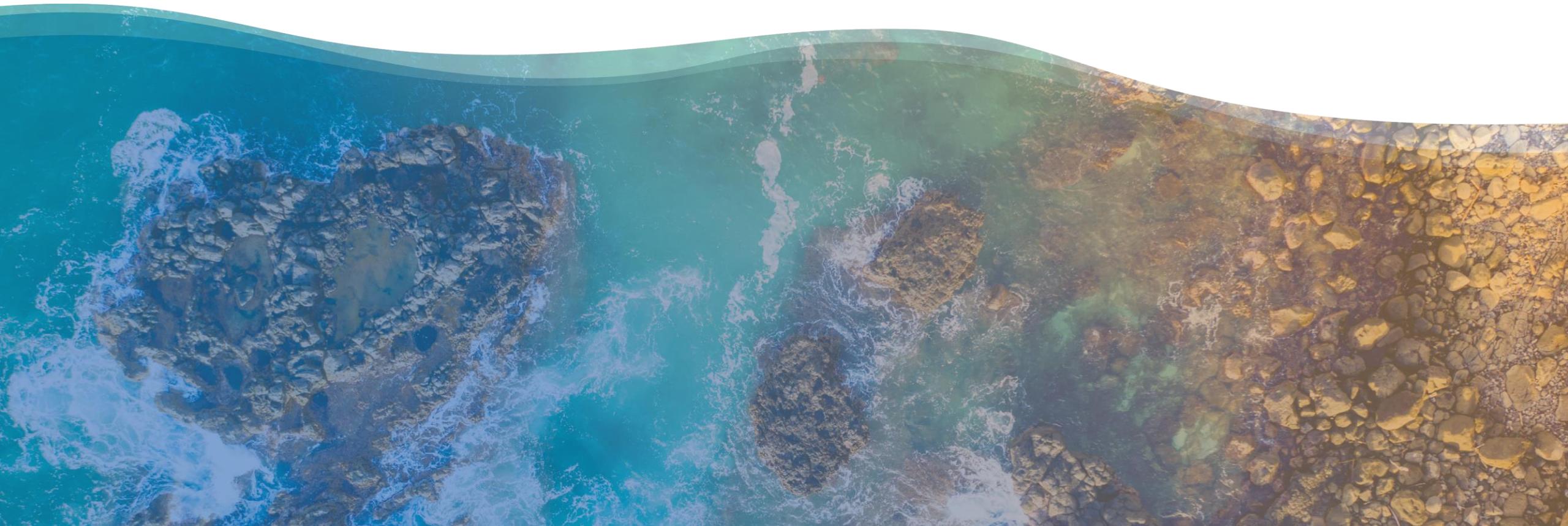
- Develop based on panel input and data review
- Used to help prioritize hotspots and projects for developing the OWH CIP



**Collaborative decision-making:**  
Criteria selection and use



# Working Toward the OWH CIP



# Working Toward the OWH CIP

Setting the Foundation

Establishing Direction

**Developing the OWH Plan**

Data Gathering and Review

Collaboration Framework

Climate Adaptation Framework

Part 1 Foundations & Information Gathering

Part 2 Applying Foundation & Information for  
Collaborative Decision Making & Project Development

One Water CIP

Trigger-Based  
Implementation  
Plan

Funding  
Strategy

Policies and  
Recommendations

Private Development  
Guidelines

# One Water CIP

## One Water CIP (prioritized projects list)

### INFLUENCED BY

- Collaboration and Climate Change Adaptation Frameworks
- Trigger-based Implementation Plan
- Funding Strategy
- Policies and Recommendations

### CONTAINS

- Prioritized Projects List addressing range of:
  - Project Types
  - Climate Hazards
  - Infrastructure Types
  - Planning Horizons

**50 Projects**

15 Near-Term  
15 Mid-Term  
20 Long-Term

# Project Concept Fact Sheets

**Each CIP project/study/plan/program description will have their own fact sheet that may include:**

- Climate threats addressed (acute/chronic)
- Infrastructure assets at risk
- Community assets at risk
- Identified as near-, mid-, or long-term project
- Adaptation strategies applied
- Co-benefits (for infrastructure, 'aina, people)
- Potential partnerships (CCH, state, community, and private entities)
- OWH objectives supported
- CRO objectives supported
- Map/location of project
- Potential challenges & considerations
- Expected timeline & triggers (potential adaptation pathway)

<b>Project Concept Name:</b>	
<b>General Description</b>	
<b>Concept Details</b>	
ID #:	#
Timeframe:	Near/Mid/Long-term
Champion agency:	TBD
Adaptation Strategy Type:	Infrastructure Project/Program/Plan/Study
Map/Location of project:	TBD
(insert map here)	
<b>Infrastructure assets at risk (list)</b>	
Water:	
Wastewater:	
Stormwater:	
<b>Community assets at risk (list)*:</b>	

**Note: Cost estimates Included for near-term projects**

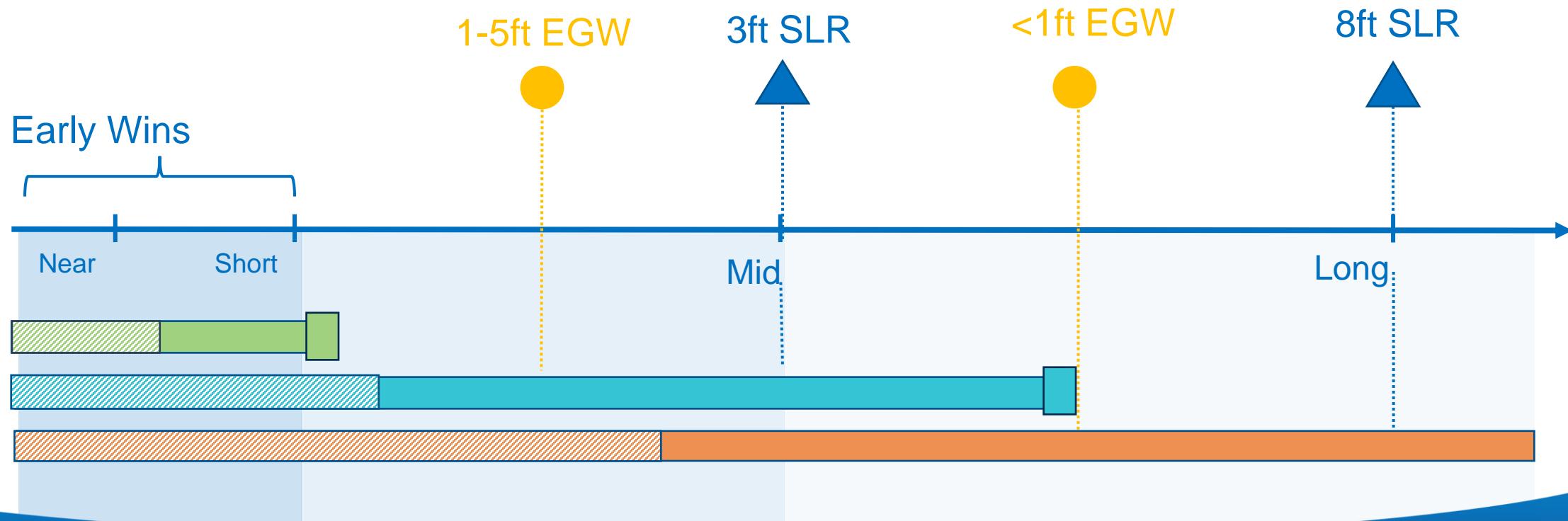
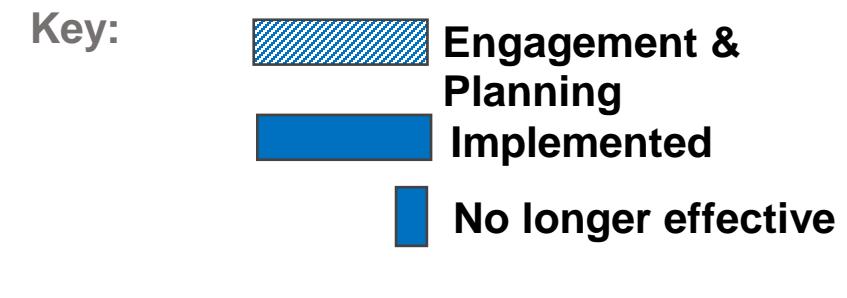
# Implementation Planning: Trigger-based Approach

## EXAMPLE CONTENTS

List of triggers ( ▲ SLR levels, ● Emergent groundwater [EGW])

List of Actions for Implementation

- Projects (A. B. C.)
- Policy Recommendations



# Collaboration and Partnerships

Engagement and Planning for Project Development includes:

- Identification of stakeholders
- Investing in partnerships
- Building upon community takeaways from previous engagement
- Consideration of multi-benefit projects realized through collaboration



Adds clarity the “When? What? Who? And how?” we need to address to develop and prioritize projects.

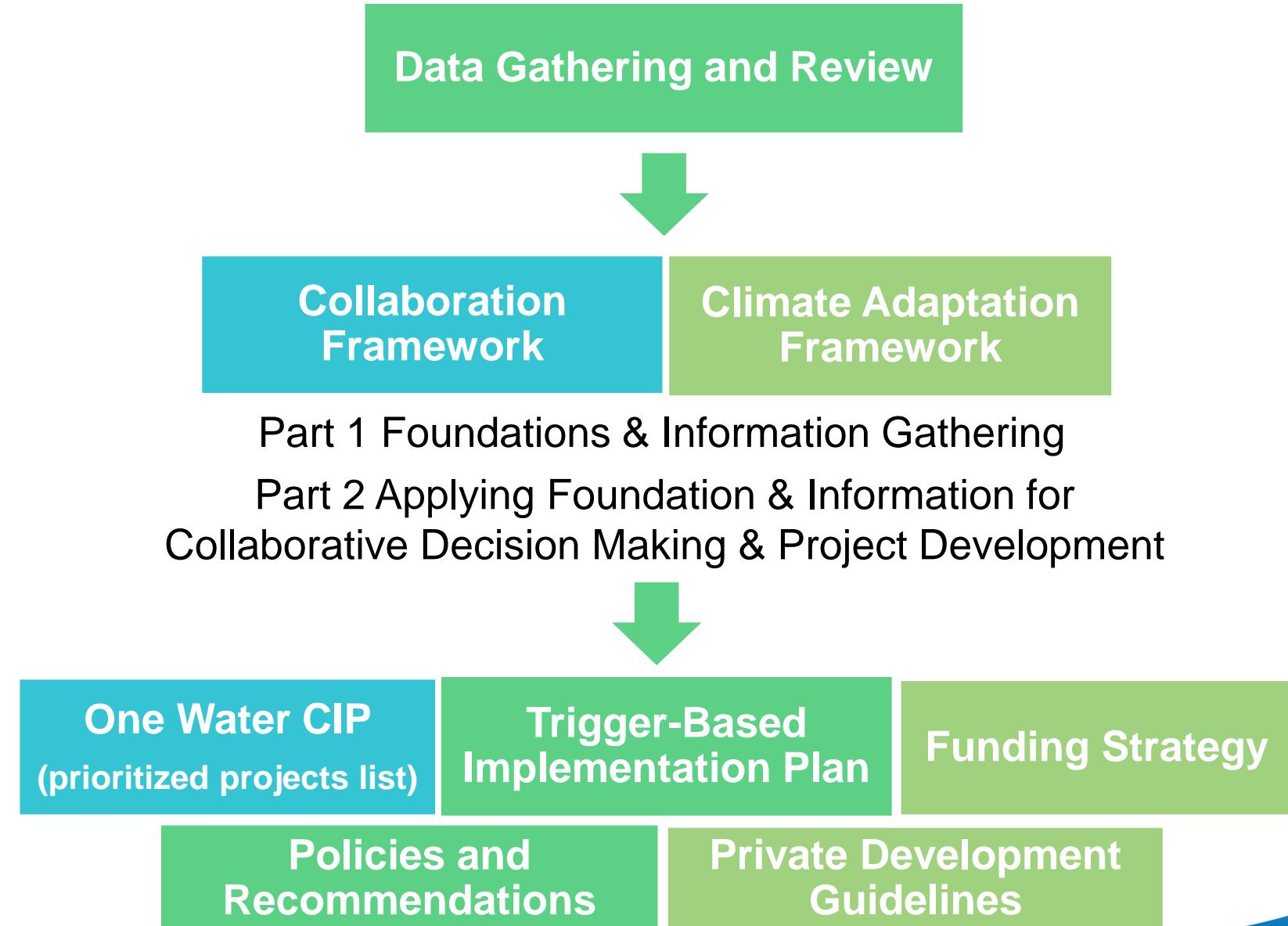
A wide-angle photograph of a tropical beach. The foreground is a sandy beach with scattered dark rocks and debris. The middle ground shows the ocean with white-capped waves. In the background, a line of palm trees and small buildings are visible under a blue sky with scattered white clouds.

# Next Steps

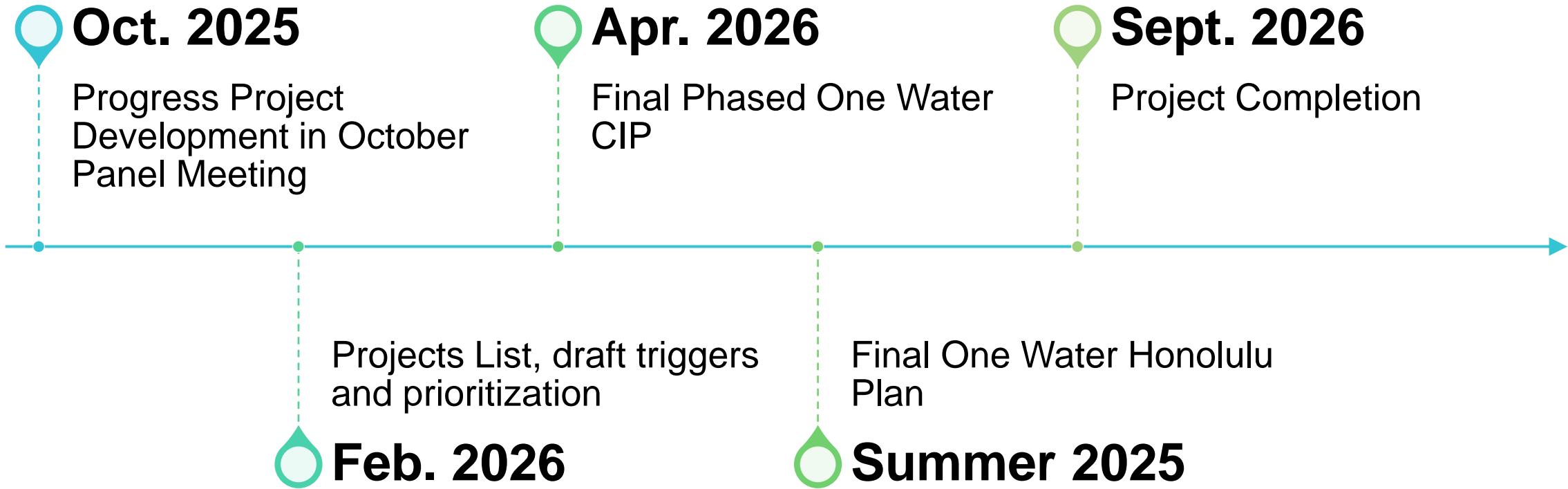
# Next Steps

## Ongoing efforts:

- Develop prioritization criteria for hotspots and projects
- Refine process for developing projects in high-risk areas
- Continued progress on all OWH outputs



# Next Steps



ONE  
WATER  
HONOLULU



# One Water Honolulu

October 15, 2025

*Mahalo for your time!*

Rachel Duncan, P.E., ENV SP  
Carollo Engineers  
[rduncan@carollo.com](mailto:rduncan@carollo.com)

Dr. Tess Sprague  
Brown and Caldwell  
[tsprague@brwncald.com](mailto:tsprague@brwncald.com)

