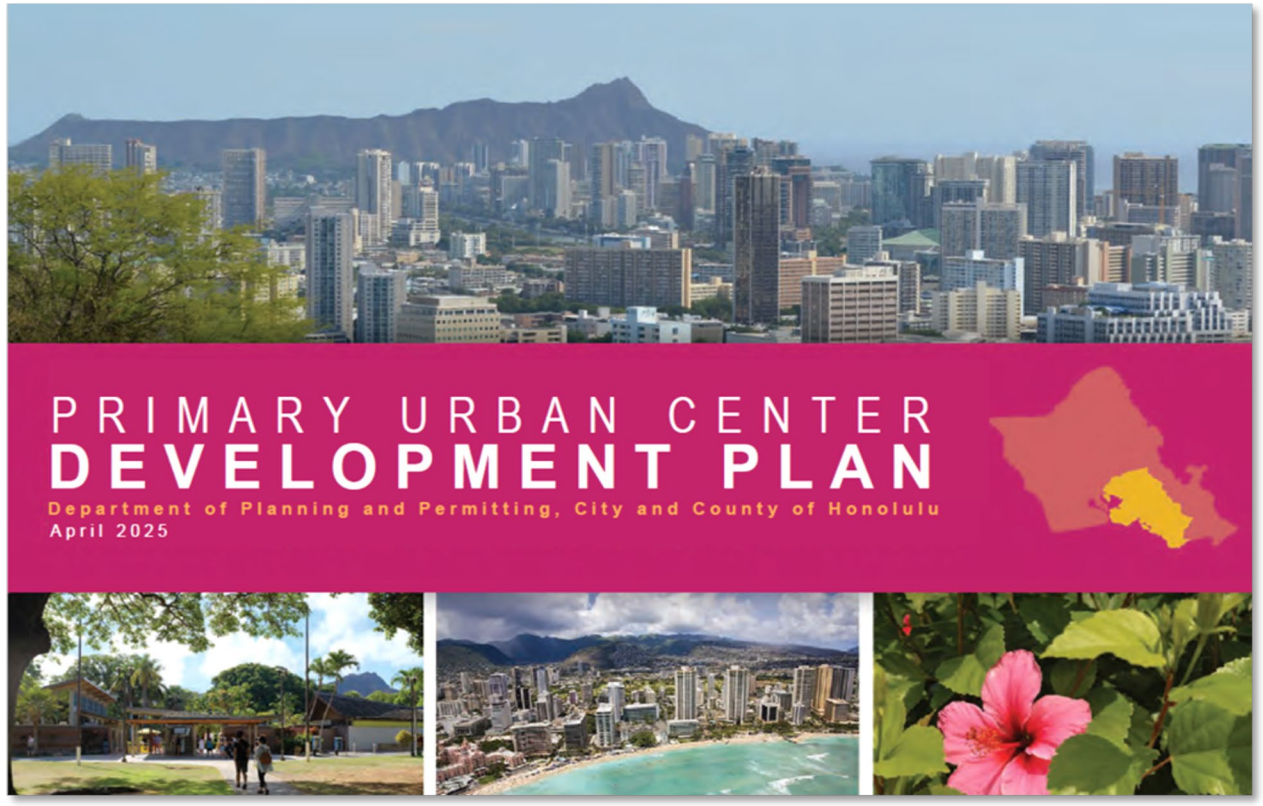
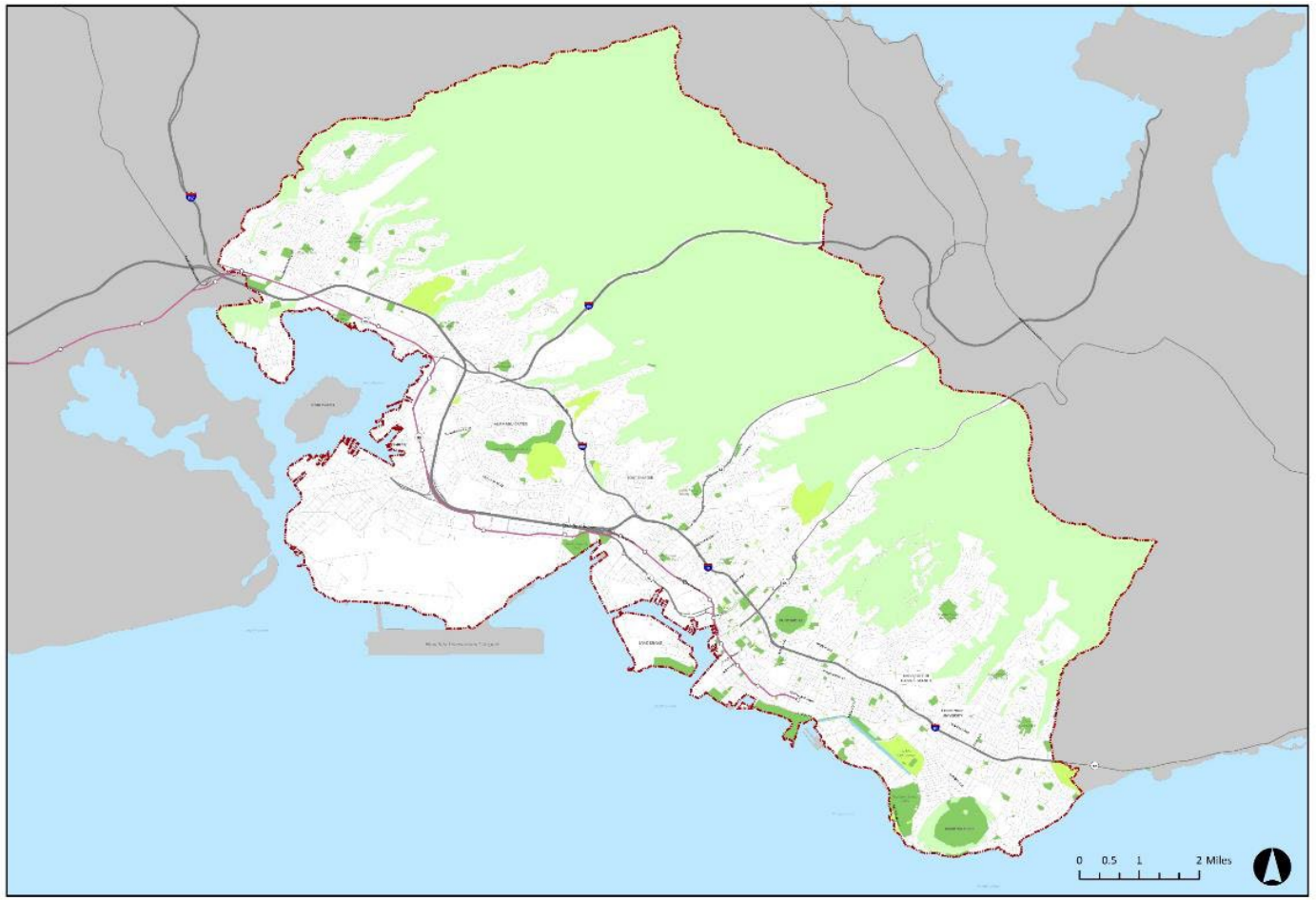


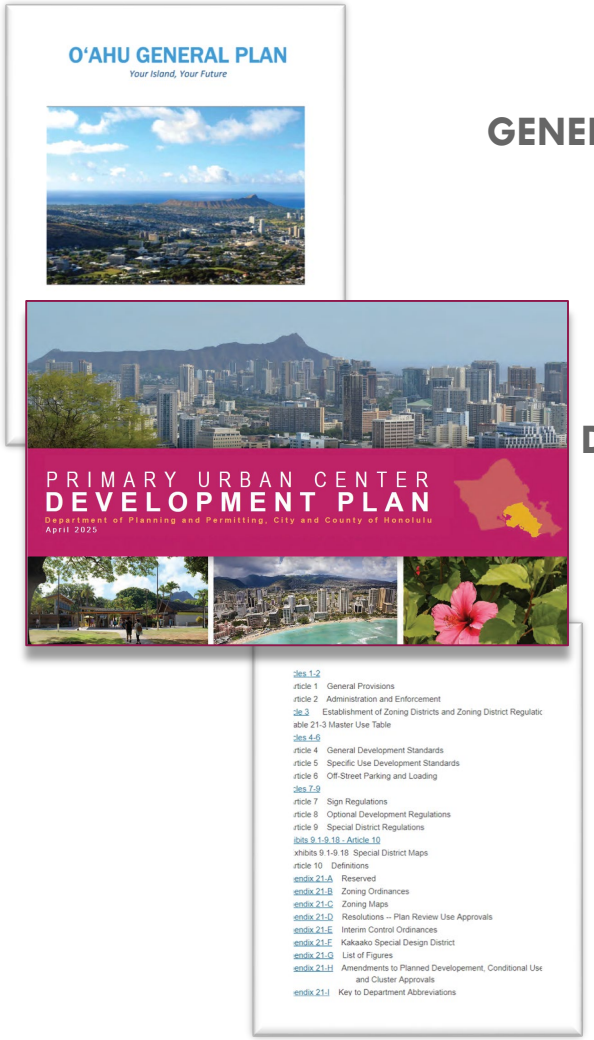
INTEGRATING CLIMATE CHANGE TOPICS INTO THE PRIMARY URBAN CENTER DEVELOPMENT PLAN

Noelle Cole, Department of Planning and Permitting
Hawai'i Water Works Association Conference
October 15, 2025

O‘AHU’S EIGHT PLANNING REGIONS

WHAT IS THE PRIMARY URBAN CENTER DEVELOPMENT PLAN?





GENERAL PLAN

DEVELOPMENT PLAN

LAND USE ORDINANCE

PREPARATION OF THE DEVELOPMENT PLANS:

Revised Charter of Honolulu S*ection 6-1509. Development Plans*

"Development plans shall consist of conceptual schemes for implementing and accomplishing the development objectives and policies of the general plan within the city. A development plan shall include a map, statements of standards and principles with respect to land uses, statements of urban design principles and controls, and priorities as necessary to facilitate coordination of major development activities.."

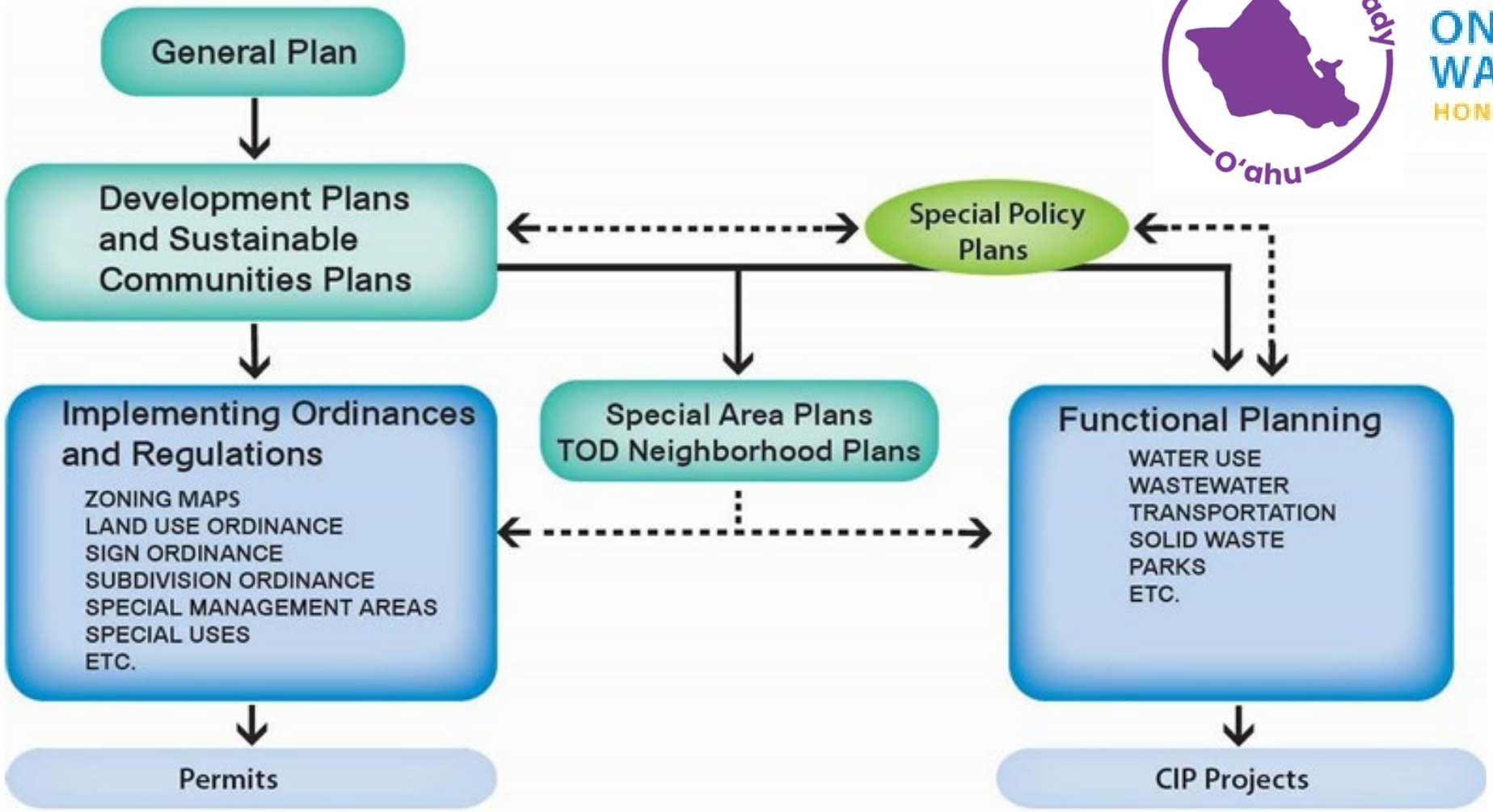
Section 6-1510. Preparation and Review of the General Plan and Development Plans

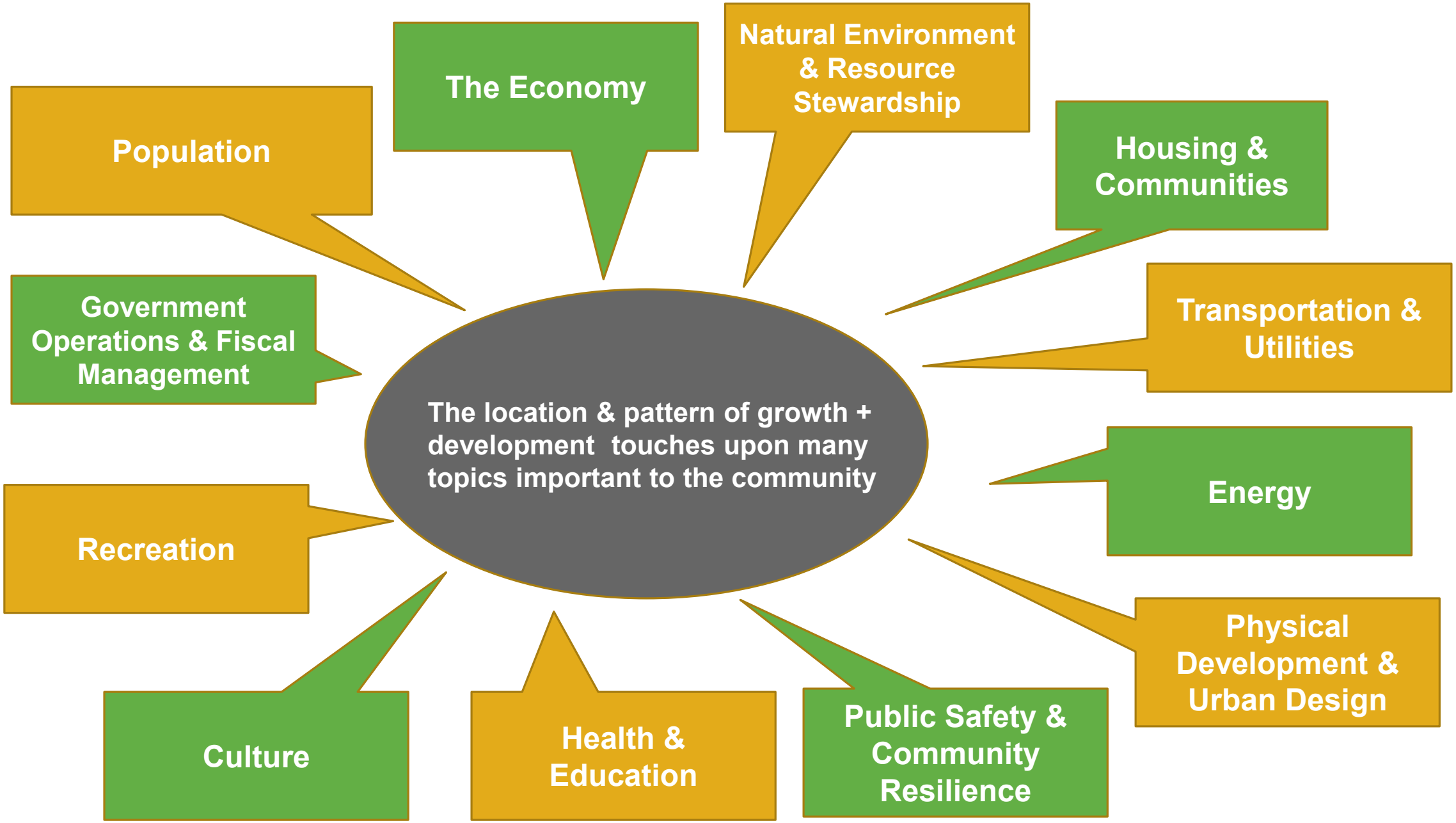
"The director shall prepare the general plan and development plans.. The people of the city living in an area likely to be affected by a development plan under preparation by the director shall be given a reasonable opportunity to present facts and arguments relative to the matters under study… In preparing such plans, the director shall consult with persons responsible for the development activities of other governmental and private organizations operating within the city"

Section 6-1511. Adoption of the General Plan and Development Plans

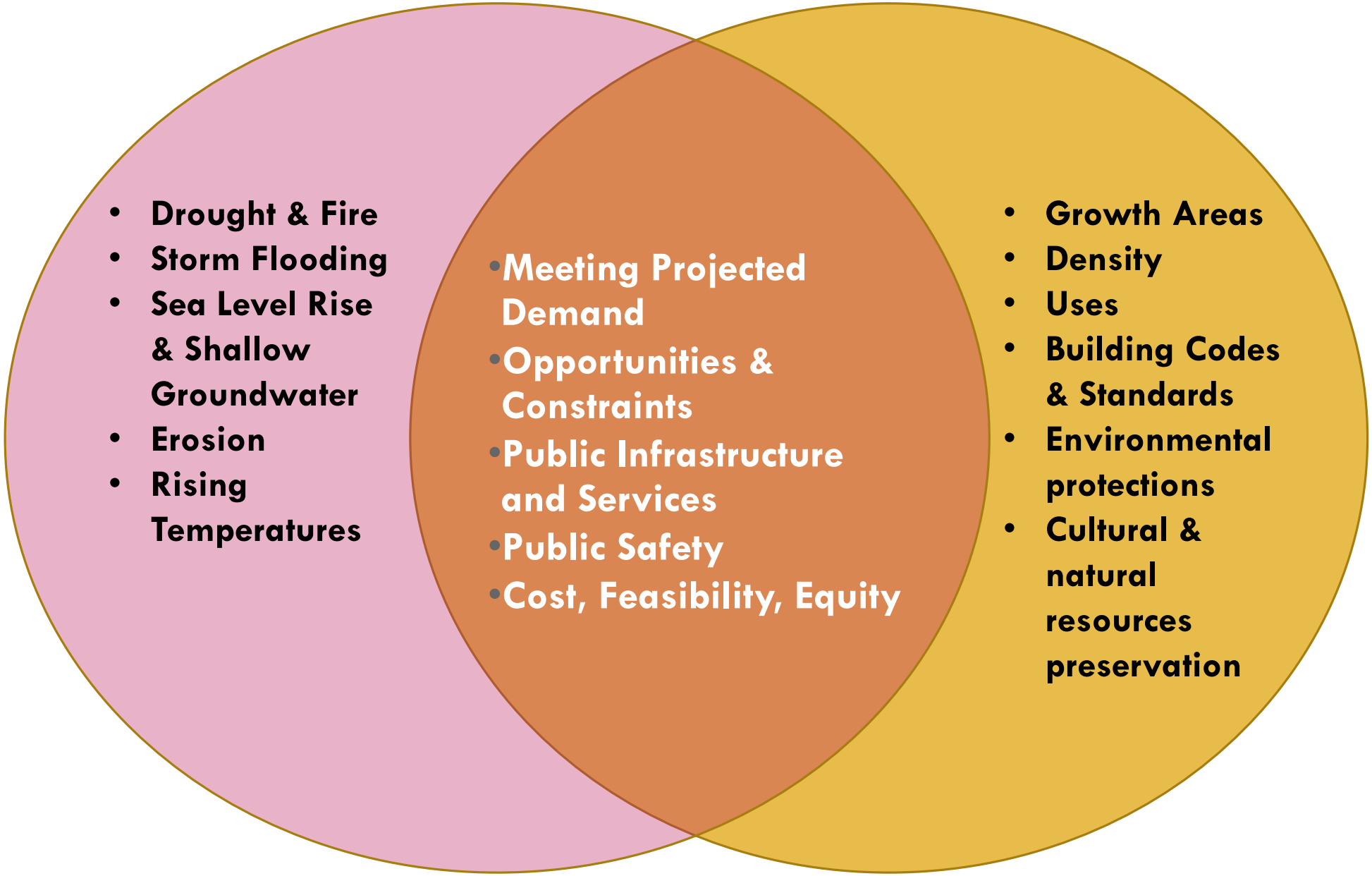
"Public improvement projects and subdivision and zoning ordinances shall be consistent with the development plan for that area, provided that development plan amendments and zoning map amendments may be processed concurrently."

ROLE OF THE DEVELOPMENT PLANS




The location & pattern of growth + development touches upon many topics important to the community
Population
The Economy
Natural Environment & Resource Stewardship
Housing & Communities
Transportation & Utilities
Energy
Physical Development & Urban Design
Public Safety & Community Resilience
Health & Education
Culture
Recreation
Government Operations & Fiscal Management

CLIMATE CHANGE – LAND USE NEXUS



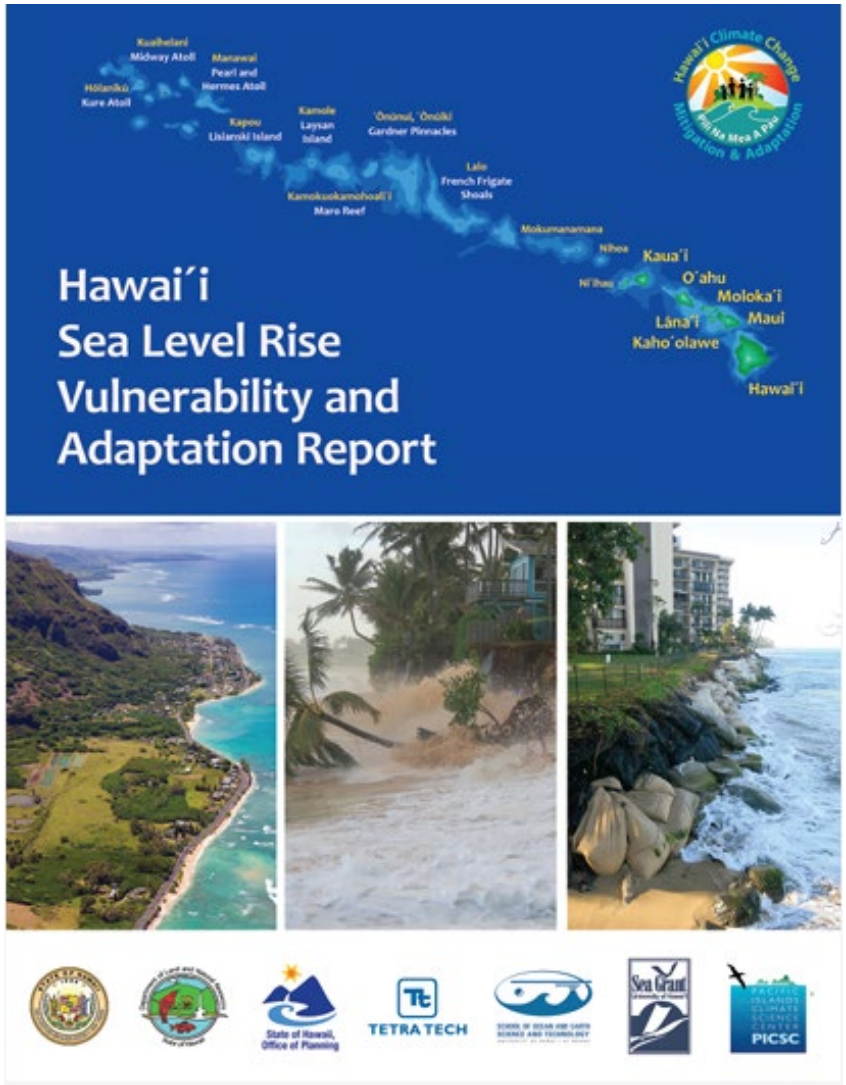
STATE CLIMATE ACTION AND GUIDANCE

- Target Setting through legislation and commitments
  - Clean Energy Goals
  - Conservation Goals
  - Emissions Goals

- Guidance to the Counties through plans and studies

- State Climate Commission, Climate Advisory Team

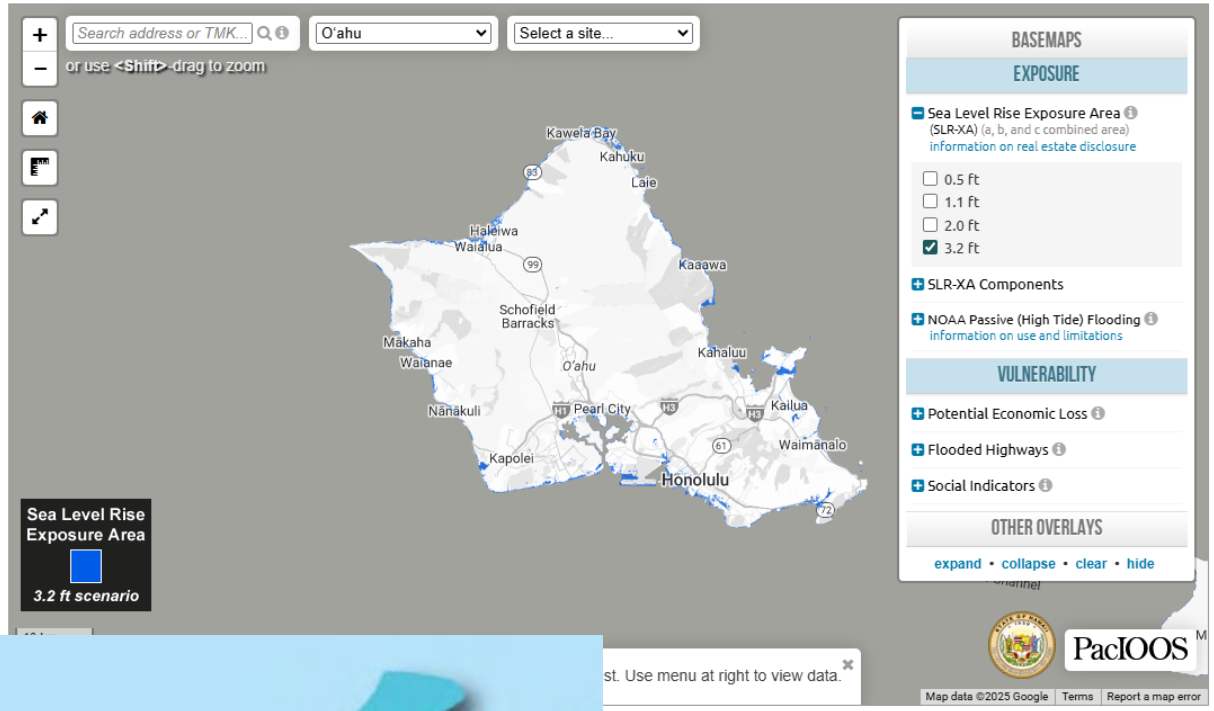
- Shoreline Management
  - CZM Program
  - SMA Permits
  - Coastal access & protections

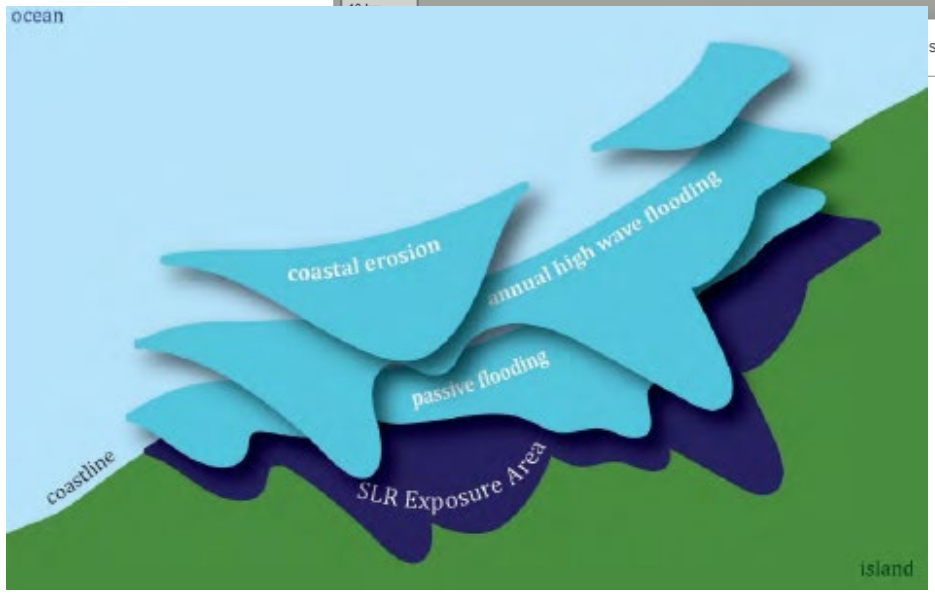


Sea Level Rise : State of Hawai'i Sea Level Rise Viewer

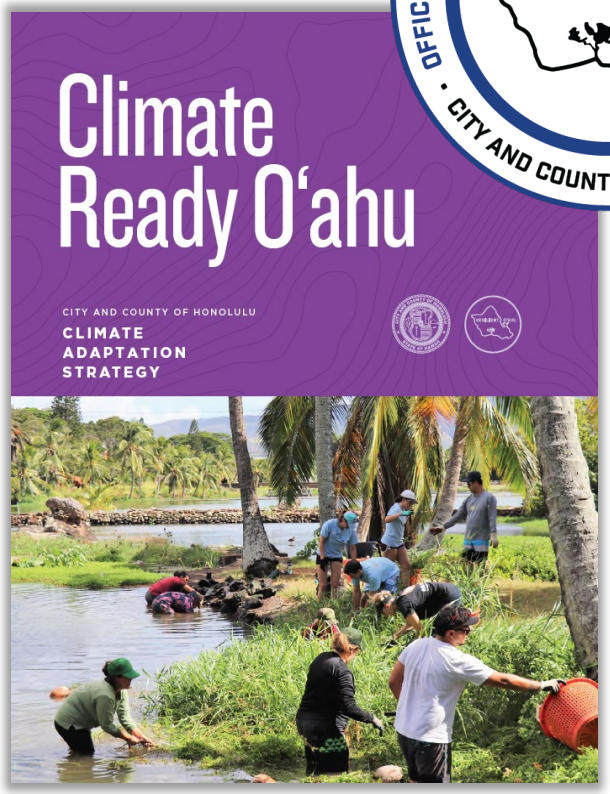
An Interactive Mapping Tool in Support of the State of Hawai'i Sea Level Rise Vulnerability and Adaptation Report

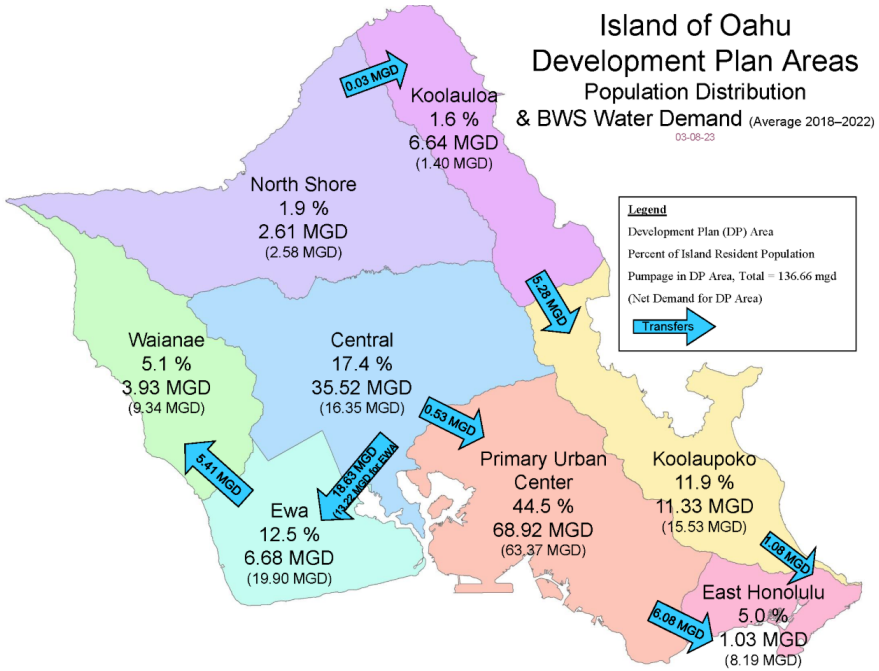
view full-screen map

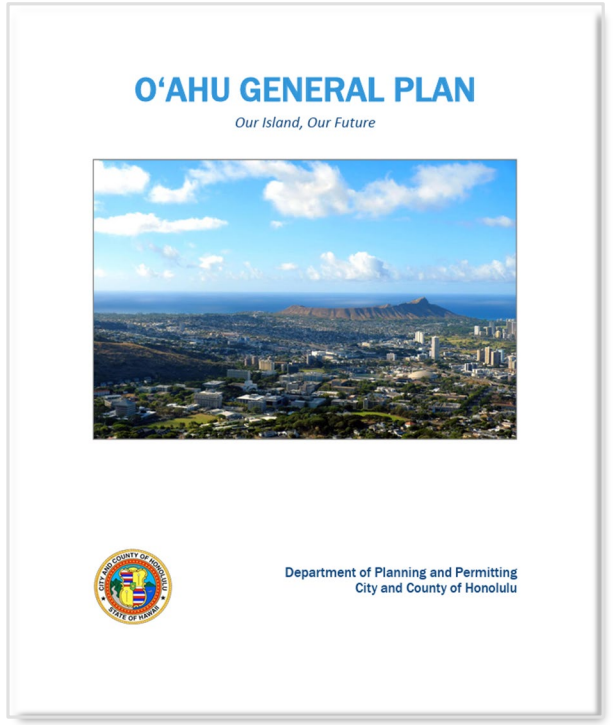




CLIMATE GUIDANCE AT CITY & COUNTY OF HONOLULU







Sea Level Rise Guidance

Adopted June 5, 2018

Updated July 29, 2022

This report builds on findings in the Hawai'i Sea Level Rise Vulnerability and Adaptation Report (2017), Sweet et al. (2017), USGCRP (2017), Sweet et al. (2018), and other scientific literature to provide specific policy and planning guidance on responding to sea level rise by the City.

Download Guidance

Download Memo

2004: Previous PUC DP Adopted

2016: Office of Climate Change, Sustainability and Resiliency established under the Mayor's Office after a 2016 Charter Amendment, and related Climate Commission (2018).

2017: The State publishes the Hawai‘i State Sea Level Rise Vulnerability and Adaptation Report and introduces the Sea Level Rise Exposure Area

2017: Hawai‘i State Climate Commission established

2018: City departments directed by Mayor to use the latest sea level rise guidance from the City Climate Commission in all planning and projects.

2020: One Water Panel is formed via Ord. 20-47

2020: TOD publishes Climate Adaptation Guidelines for Urban Development

2023: Shoreline setbacks and SMA rules updated (Ords. 23-3 and 23-4)

BIG THEMES AND ISSUES

Housing affordability, types and conditions

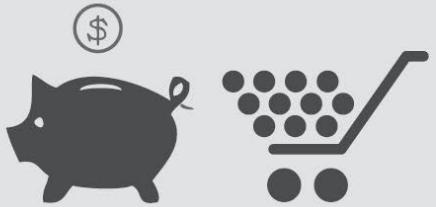
Mobility improvements including rail, bus, bicycle, pedestrian, and roadway facilities

Setting priorities for major infrastructure improvements

Creating livable, "age-friendly" communities

The location, amount and type of new development

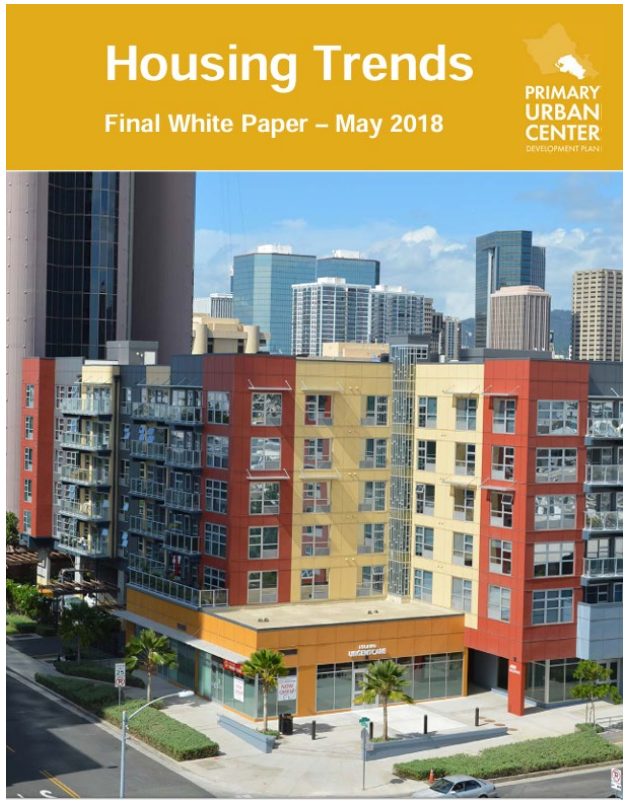
Planning for climate change and sea level rise

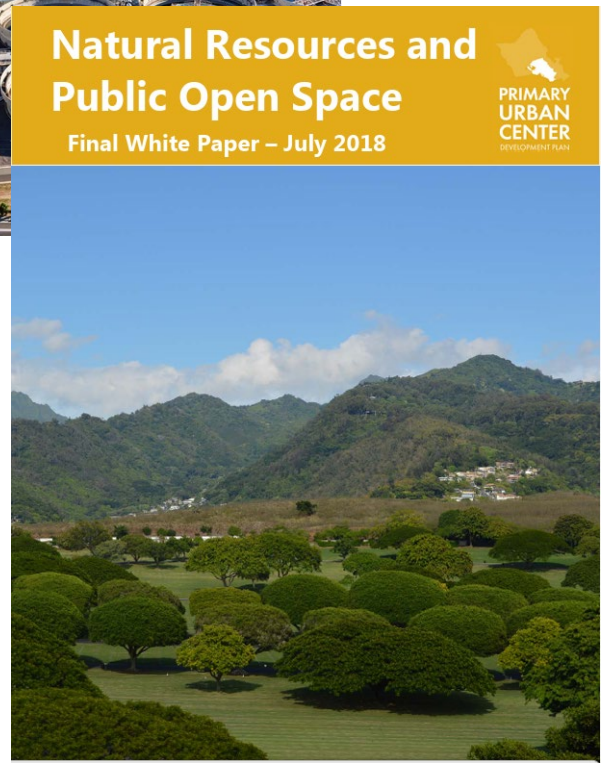


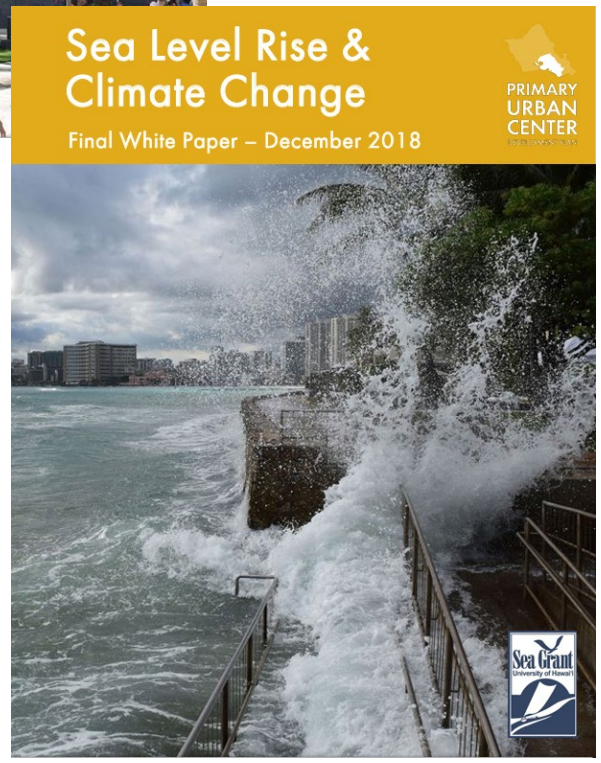
Creating a diverse and prosperous economy

Preserving and enhancing parks, open spaces and natural features

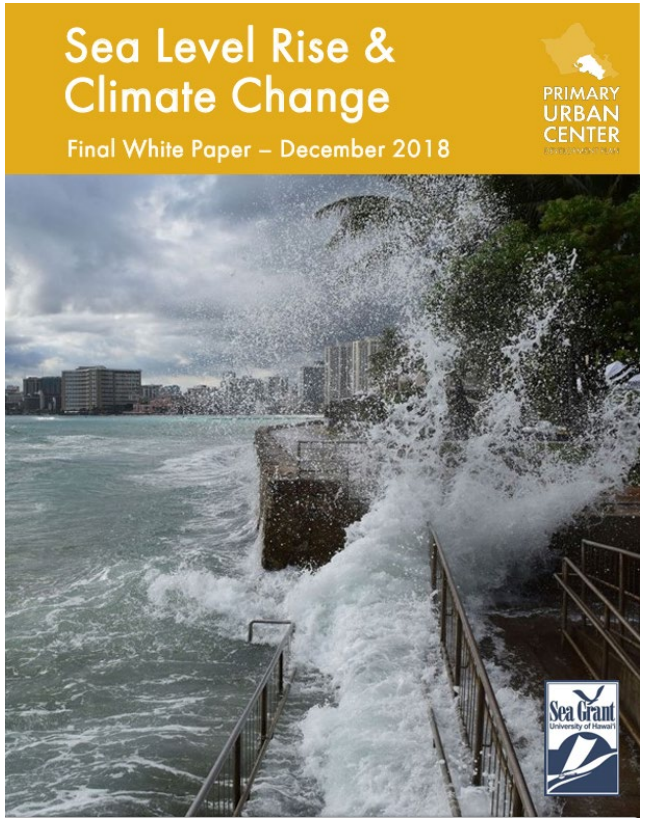
RESEARCH PAPERS





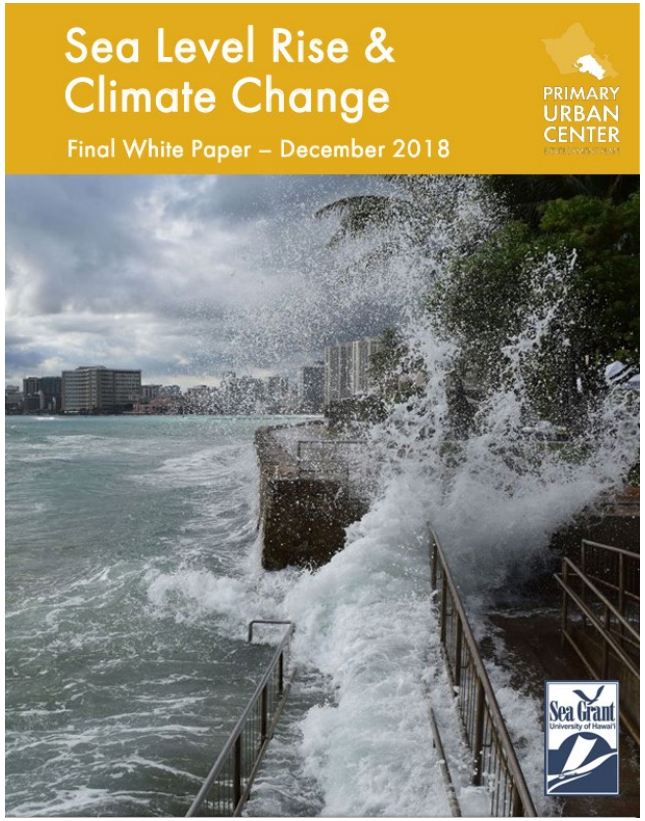


SLR: KEY TAKEAWAYS FOR THE PUC



- 3.2 feet of sea level rise could be seen by the end of the century under intermediate estimates; high tide flooding could be experienced decades before.
- The PUC is 18% of the island's total land area, but the impacts are disproportionately higher than elsewhere due to the density of development on low-lying coastal areas.
- 1800 acres and 24 miles of road would be chronically flooded with 3.2 ft of sea level rise and displacement of at least 4,300 residents.
- Public utilities at or below ground level will be impacted.
- Flooding is particularly pronounced at the mauka end of Pearl Harbor, Hickam Airforce Base and the reef runway, the industrial area of Māpunapuna, Ala Moana, Waikīkī, and makai portions of McCully-Mō'ili'ili.

OTHER KEY TAKEAWAYS:

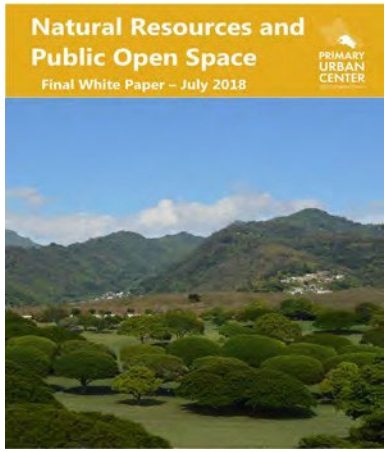


- Increase of global mean air temperatures in this century of 1.8 degrees F with a 2 to 5 degree F increase expected by 2100 depending on future emissions.
- More prolonged periods of drought and stress on freshwater sources
- Decreased precipitation and more intense storms when they do occur

PROJECT WORKFLOW

Completed 2018

Phase 1: Information Gathering

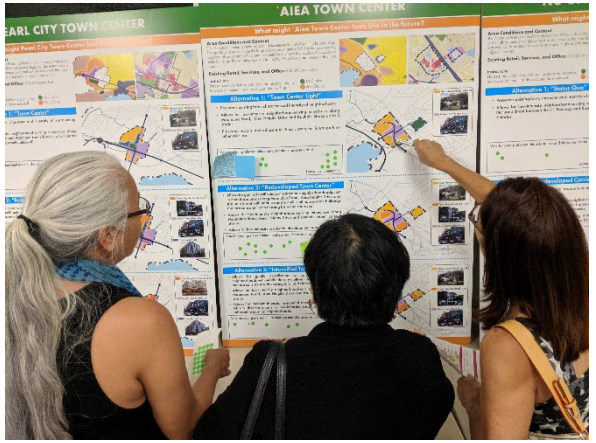


Completed 2019

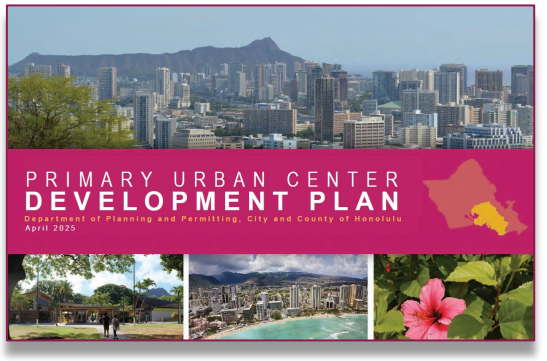
Phase 2: Visioning

Completed 2022

Phase 3: Policy Drafting and Alternatives



Phase 4: Public Review, Proposed Plan and Adoption



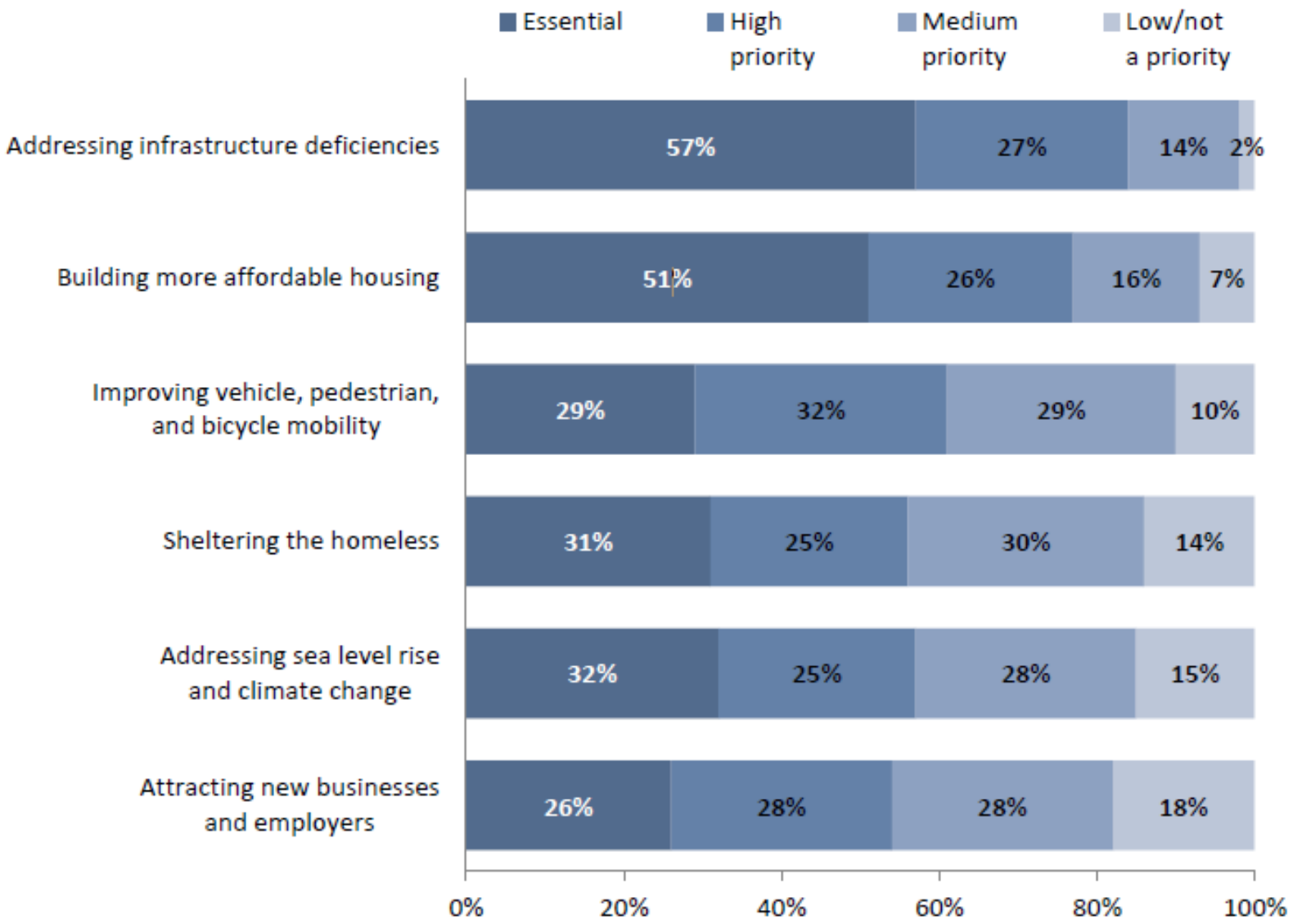
Adopted April 2025


36
Stakeholder + Agency Interviews
1
Public Review Draft
31
Pop-up Workshops in 3 rounds
3
Growth and Change Workshops
2
Online Special Surveys
3
Policy Preview Workshops
895
Statistically Valid and 174 Opt-in Survey Responses
11
Public Review Draft Presentations
2
Planning Commission Hearings
1
Vision Forum
1
Policy Direction Preview
4
NB Focus Group Meetings

STATISTICAL SURVEY (2018)

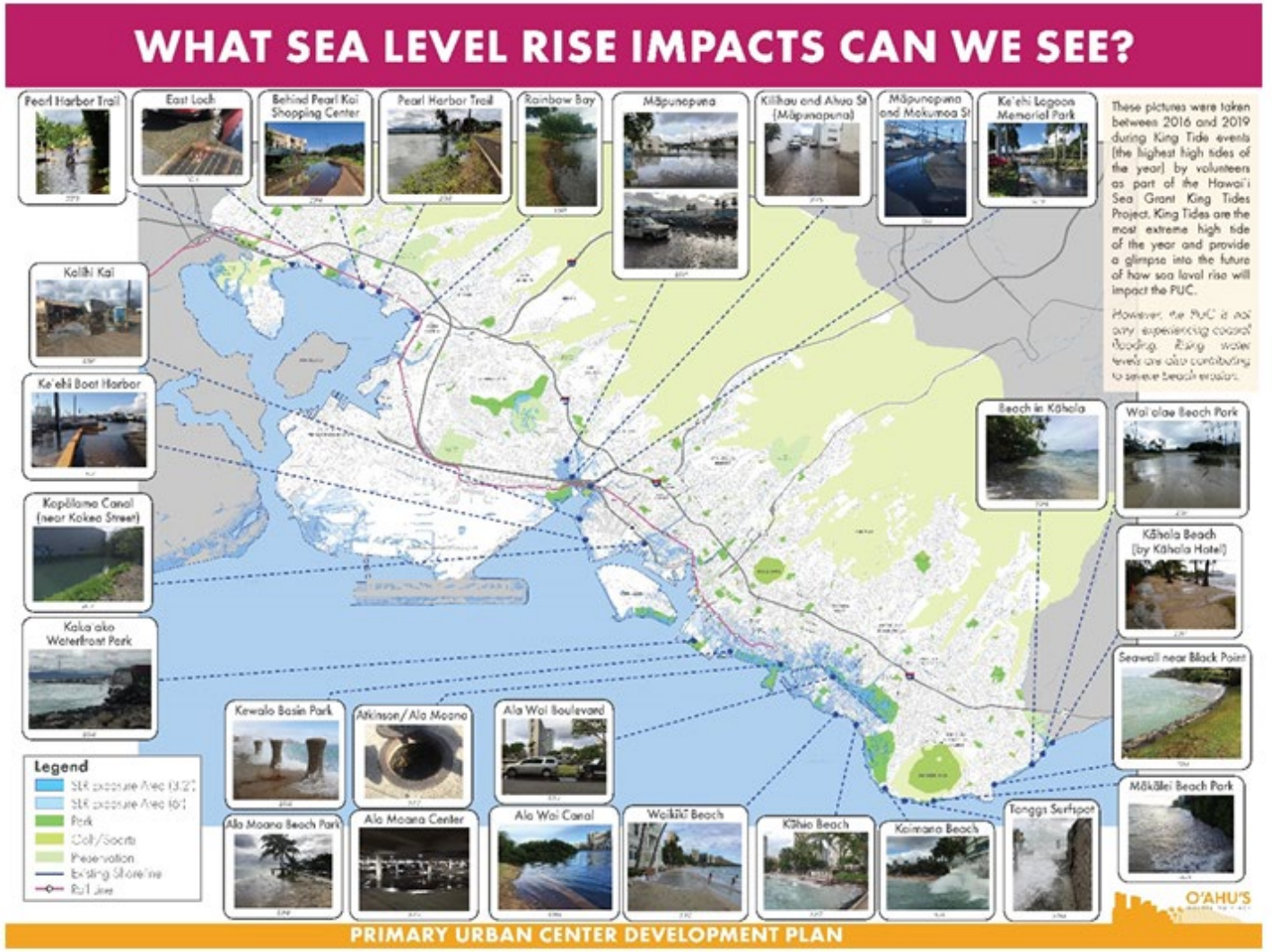
- Most residents rejected the idea of doing nothing to address sea level rise (80% strongly, 8% somewhat)
- Over 55% consider funding and staffing to address climate change essential (32%) or a high priority (25%)
- Seawalls are the most unpopular solution we polled with over 35 % strongly opposing and 22% somewhat opposing
- Development restrictions in impacted areas (immediate or gradual) scored highest with close to 80% support
- Changing codes and standards also scored high with close to 70% support, although tentative (39% was “somewhat support”)

STATISTICAL SURVEY (2018)



SLR POP-UPs


STAFF ONLY
CLOSED
BOOK DROP
HOW DO WE ADDRESS SEA LEVEL RISE?
HOW DO WE ADDRE


WHAT SEA LEVEL RISE IMPACTS CAN WE SEE?
Pearl Harbor Trail
East Loch
Behind Pearl Kai Shopping Center
Pearl Harbor Trail
Rainbow Bay
Māpunapuna
Kilihau and Ahua St (Māpunapuna)
Māpunapuna and Makumoa St
Ke'ehi Lagoon Memorial Park
These pictures were taken between 2016 and 2019 during King Tide events (the highest high tides of the year) by volunteers as part of the Hawai'i Sea Grant King Tides Project. King Tides are the most extreme high tide of the year and provide a glimpse into the future of how sea level rise will impact the PUC.
However, the PUC is not only experiencing coastal flooding. Rising water levels are also contributing to severe beach erosion.
Kalihi Kai
Ke'ehi Boat Harbor
Kapālama Canal (near Kokea Street)
Kaka'ako Waterfront Park
Beach in Kāhala
Wai'alae Beach Park
Kāhala Beach (by Kāhala Hotel)
Seawall near Black Point
Kewalo Basin Park
Atkinson/Ala Moana
Ala Wai Boulevard
Ala Moana Beach Park
Ala Moana Center
Ala Wai Canal
Waikīkī Beach
Kūhio Beach
Kaimana Beach
Tonggs Surfspot
Mākālei Beach Park
Legend
SLR exposure Area (3.2')
SLR exposure Area (6')
Park
Golf/Sports
Preservation
Existing Shoreline
Rail Line
O'AHU'S
PRIMARY URBAN CENTER DEVELOPMENT PLAN

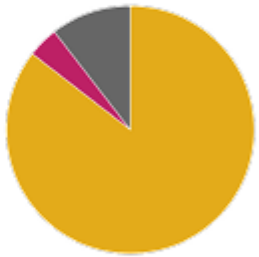
Yes No Unsure

Low-Impact Development (LID) Projects

Green infrastructure strategies had the highest overall support, with 90% yes votes. Example projects include bioswales, retention ponds, rain gardens, permeable pavements, green roofs, infiltration planters, and similar.

Resilient Building Design Guidelines/Standards

Requiring new buildings in impacted areas to comply with specific sea level rise-oriented standards received strong support, with 85% yes votes. Unsure was fairly high.



Development Restrictions tied to Triggers

Establishing physical benchmarks (i.e. number/frequency of flooding events) that trigger escalating development restrictions received strong support, with 80% yes votes. Unsure was very high.

Incentivized Retreat

On the question of whether the City should buy private land most threatened by sea level rise, response was very mixed, with only half voting yes. Both No and Unsure was over one-quarter, perhaps reflecting concern over the cost of this action.

New Adaptation Funding

Similar to the above strategy, response was very mixed. Unsure was particularly high, reflecting a need to educate the public about the costs and trade-offs of adaptation.

Private Sea Walls

Opposition was very strong to continue allowing individual owners to build and rebuild concrete sea walls despite evidence that seawalls lead to beach loss, with 80% no votes. Unsure was fairly high.

Water Resources

WATER RESOURCES

- Use a One Water management approach that integrates: conservation, stormwater management, sea level rise, potable water supply, and wet infrastructure

- Protect ground and surface water quality from polluting land uses
  - Enhance habitat function + flood prevention of PUC's streams

- Maintain resilient water infrastructure systems
  - Improve coordination of wastewater infrastructure and land use planning

Healthy Communities

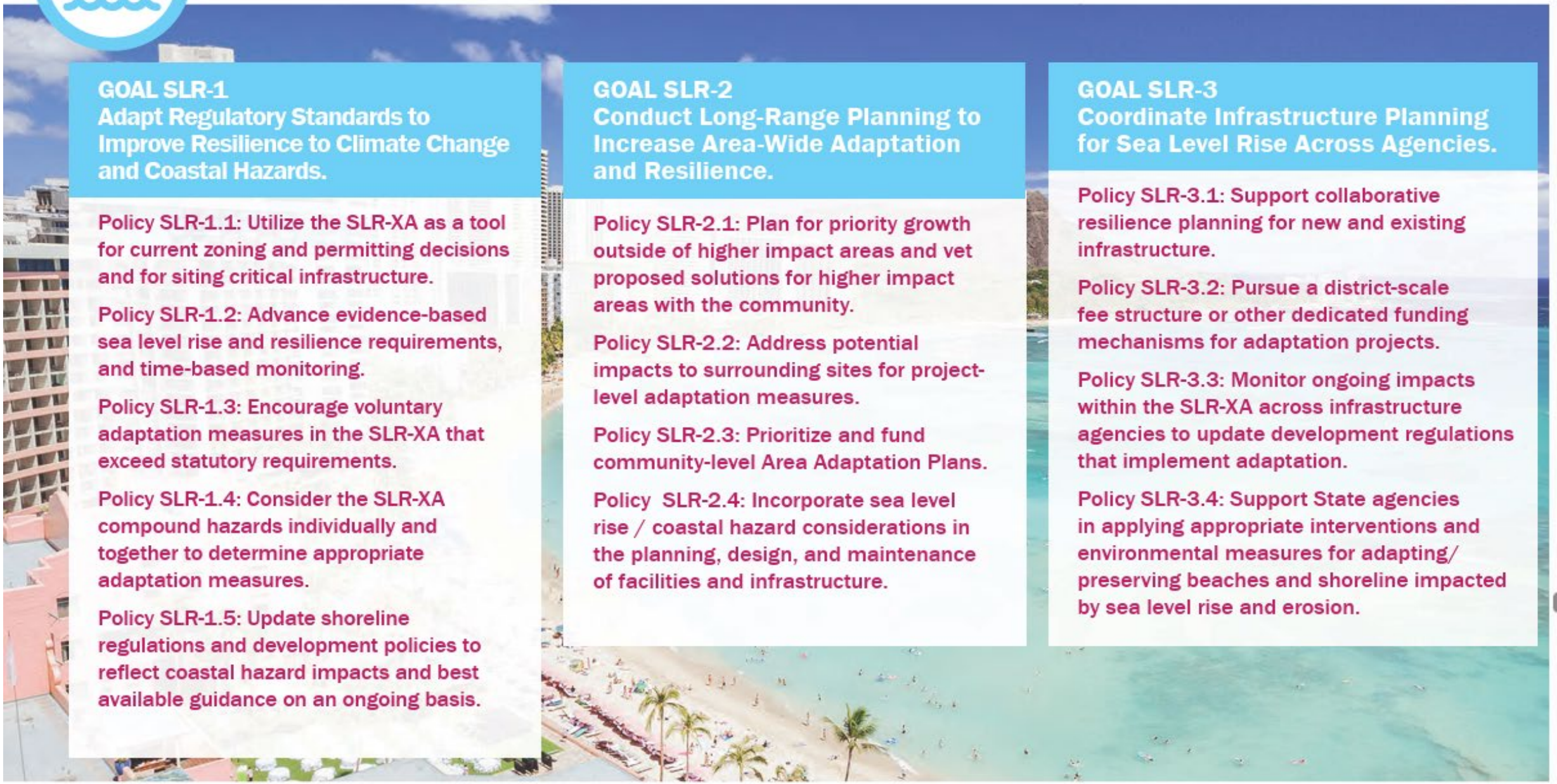
HEALTHY COMMUNITIES

- 1. Foster healthy building practices
  - Materials choice
  - Energy efficiency
  - Urban Heat Island
- 2. Shape an "Age-Friendly" community that responds to the needs of all residents
  - Increase opportunities for physical activity
  - Provide high-quality living options for kūpuna to keiki
  - Improving accessibility and navigability of public spaces
- 3. Support initiatives that improve community engagement, health, and equity
  - Improve hazards planning across whole community
  - Improve civic engagement
  - Collaboration with community-focused initiatives

Sea Level Rise + Coastal Hazards Planning

241

Sea Level Rise + Coastal Hazards Planning



GOAL SLR-1
Adapt Regulatory Standards to Improve Resilience to Climate Change and Coastal Hazards.

Policy SLR-1.1: Utilize the SLR-XA as a tool for current zoning and permitting decisions and for siting critical infrastructure.

Policy SLR-1.2: Advance evidence-based sea level rise and resilience requirements, and time-based monitoring.

Policy SLR-1.3: Encourage voluntary adaptation measures in the SLR-XA that exceed statutory requirements.

Policy SLR-1.4: Consider the SLR-XA compound hazards individually and together to determine appropriate adaptation measures.

Policy SLR-1.5: Update shoreline regulations and development policies to reflect coastal hazard impacts and best available guidance on an ongoing basis.

GOAL SLR-2
Conduct Long-Range Planning to Increase Area-Wide Adaptation and Resilience.

Policy SLR-2.1: Plan for priority growth outside of higher impact areas and vet proposed solutions for higher impact areas with the community.

Policy SLR-2.2: Address potential impacts to surrounding sites for project-level adaptation measures.

Policy SLR-2.3: Prioritize and fund community-level Area Adaptation Plans.

Policy SLR-2.4: Incorporate sea level rise / coastal hazard considerations in the planning, design, and maintenance of facilities and infrastructure.

GOAL SLR-3
Coordinate Infrastructure Planning for Sea Level Rise Across Agencies.

Policy SLR-3.1: Support collaborative resilience planning for new and existing infrastructure.

Policy SLR-3.2: Pursue a district-scale fee structure or other dedicated funding mechanisms for adaptation projects.

Policy SLR-3.3: Monitor ongoing impacts within the SLR-XA across infrastructure agencies to update development regulations that implement adaptation.

Policy SLR-3.4: Support State agencies in applying appropriate interventions and environmental measures for adapting/ preserving beaches and shoreline impacted by sea level rise and erosion.

Existing Shoreline Types: varying conditions along the PUC coastline

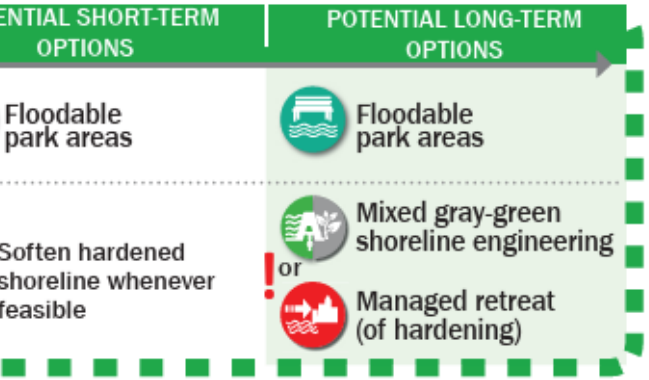
The coastline of the PUC is not uniform; there are a variety of conditions from natural environments, to manmade recreation areas and hardened shoreline of various types. The following pages are the general categories of coastal conditions in the PUC followed by some of the short and longer-term adaptation strategies that may be appropriate for each.

Recreation Area: Engineered Beach

This shoreline type includes Ala Moana Beach Park and Waikīkī, Beach. These beaches were expanded or constructed through past beach nourishment projects, are stabilized by groins, breakwalls, and other coastal engineering structures, and are backed by seawalls. Chronic beach erosion is an existing problem in most of these areas. Ala Moana and Waikīkī beaches are subject to ongoing beach restoration projects.

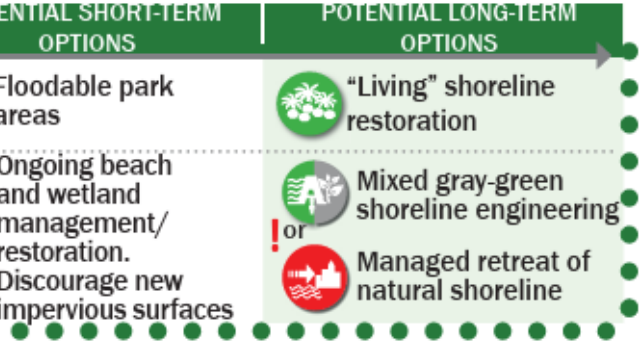
Recreation Area: Hard Shoreline

Beach parks and other shoreline-adjacent recreation areas are particularly exposed to sea level rise. Fields and grassy areas can be permanently damaged if flooded. Many landscaping plants can die if exposed to salinity and should be transitioned to salt-tolerant planting. Beaches that are already eroding will increasingly need to be actively managed. Sans Souci State Recreation Area (Diamond Head side of Waikīkī) and Sand Island are examples.



Recreation Area: Natural Shoreline/Beach

Natural shoreline parks such as Kuilei Cliffs Beach, Kaimana Beach, Ke'ehi Lagoon Beach Park, a portion of Sand Island Beach Park, 'Aiea Bay State Recreation Area, and Neil S. Blaisdell Park, can provide critical flood and stormwater management functions. Alternative landscape options to grass that are more resilient to flooding and salt water intrusion should be encouraged. These natural areas with soft edges are vulnerable to climate change, since elevations of tidal marshes will not naturally keep up with sea level rise, and there is very limited space for them to migrate inland.



Adapt | "Work with the Water"

Beach Nourishment and Management

Beach nourishment is the practice of replacing sand on a beach to mitigate erosion and restore beach width using clean compatible sand, typically accomplished using heavy machinery. Engineered beach stabilization structures may also be employed. Beach nourishment is already a common practice in Waikīkī.

Related Considerations:

- Protects valuable beaches and backshore areas;
- Avoids most issues caused by walls/revetments and helps to preserve shoreline access;
- Requires significant dredging of sand (that typically comes from a nearshore deposit);
- Environmental risks to the nearshore marine ecosystem;
- Maintenance: continual nourishment is needed on a chronically eroding beach.

Nature-based "living" shoreline restoration

A living shoreline is a protected, stabilized coastal edge made of natural materials like plants and sand dunes. Unlike a concrete structure, which impedes the growth of plants and animals, living shorelines grow over time. Often referred to as 'soft armoring.'

Related Considerations:

- Accommodates natural erosion/ sea level rise over a longer term;
- Avoids most drawbacks that arise from hard armoring;
- Usually only suited to lower movement, back-bay, wetland or lagoon environments;
- On O'ahu, shoreline restoration can include fishpond restoration and other aquaculture.

Floodable Parks

A floodable park is created by re-purposing low-lying areas so they can be temporarily flooded during extreme rainfall events. These areas would be designed to absorb stormwater and/ or elevated groundwater, and decrease run-off or flooding by storing excess water and releasing it slowly. They can be a hard or soft engineered intervention.

Related Considerations:

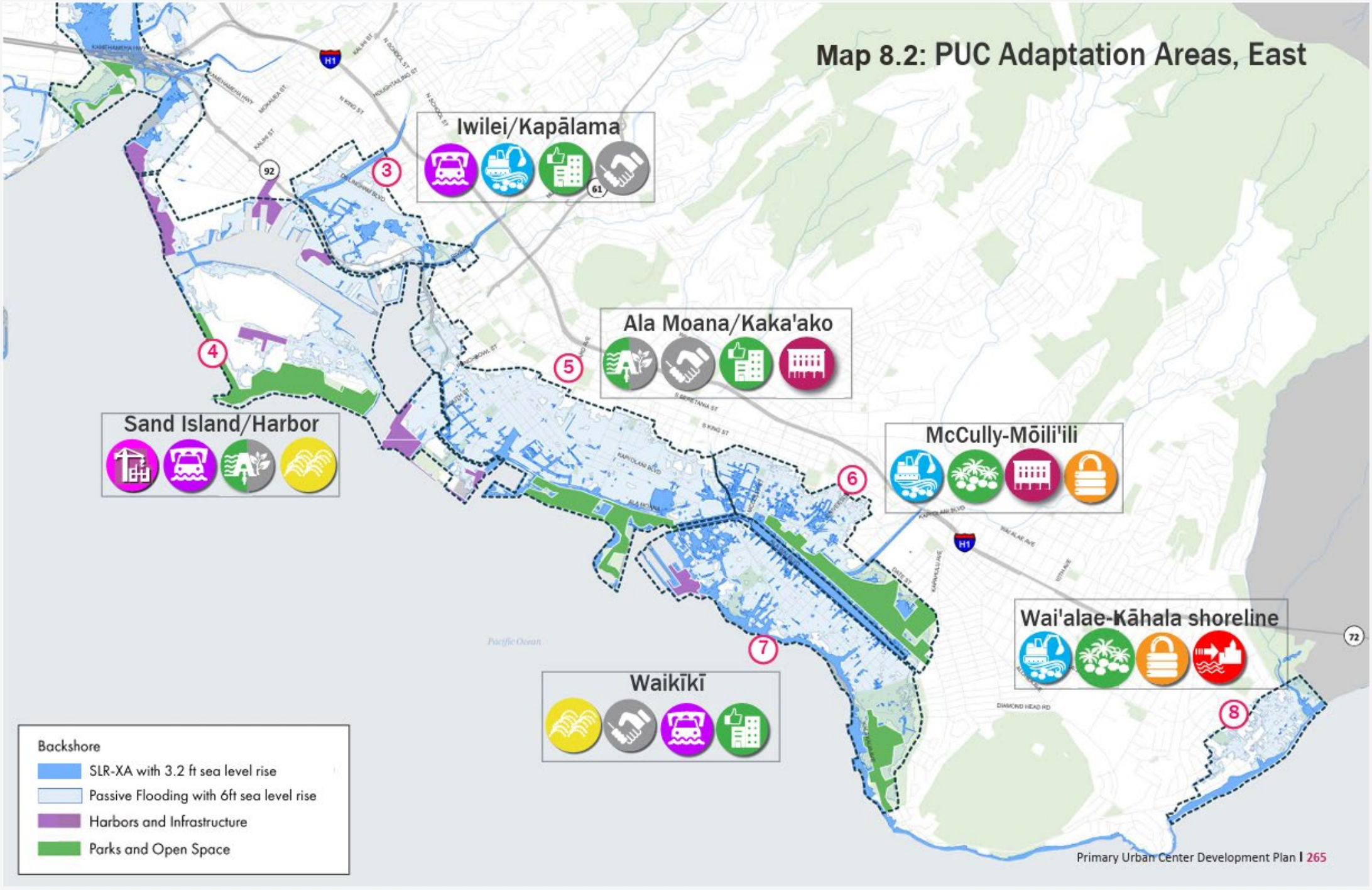
- Leverages existing open space;
- Provides combined amenity, resilience, and biodiversity benefits;
- Parks are unusable for recreation during flooding;
- Need to address polluted water.

Mixed Green-Gray Engineering

A hybrid systems approach that combines elements of hardening with naturalized areas to mimic ecological processes. Often comprised of bioretention planters, permeable paving, or other infiltrative surfaces. Includes projects such as retrofitting or naturalizing coastal storm sewer outflows, rehabilitation of combined sewer pipes, and lateral cross-connection of pipes (to increase storage during storms).

Related Considerations:

- Appropriate in creeks/streams/ canals or marsh/vegetated/ wetland environments;
- High maintenance levels may be needed;
- Potential benefits for urban environments.


Map 8.2: PUC Adaptation Areas, East
Iwilei/Kapālama
Ala Moana/Kaka'ako
Sand Island/Harbor
McCully-Mōili'ili
Wai'alae-Kāhala shoreline
Waikīkī
3
4
5
6
7
8
Backshore
SLR-XA with 3.2 ft sea level rise
Passive Flooding with 6ft sea level rise
Harbors and Infrastructure
Parks and Open Space
Pacific Ocean

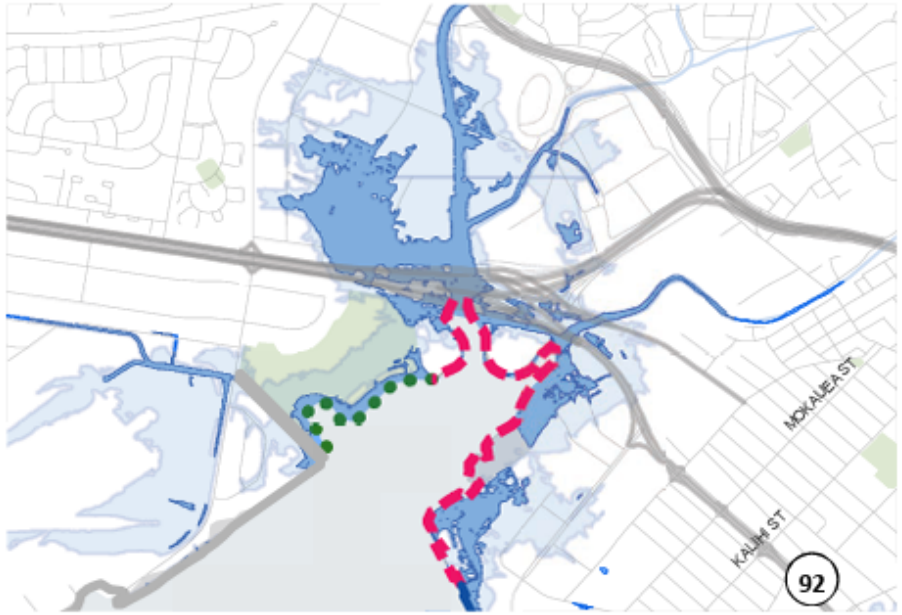
2 Adaptation Area Overview: Māpunapuna + Kalihi Kai

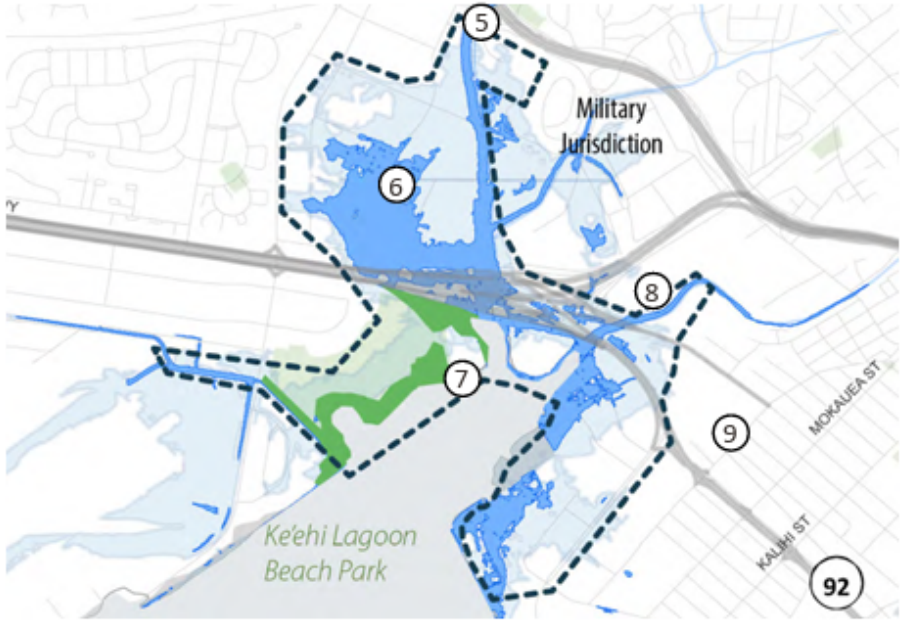
Current and Projected Impacts

- Chronic flooding of beach park
- Chronic flooding of streets + businesses
- Deterioration of marsh/wetland shore
- Stream overflows during storms

Priority Strategies

The industrial area of Māpunapuna and the ewa edge of Kalihi Kai are adjacent to Ke'ehi Lagoon near the terminus of Moanalua Stream and the Kapālama Canal, respectively. Both areas are low-lying and subject to storm-induced drainage issues and Māpunapuna in particular suffers from widespread nuisance flooding. Studies of the area are ongoing, and comprehensive adaptation planning should be a top priority as rising sea levels will exacerbate an already pronounced issue. The bulk of the flooding can be expected from passive (i.e. groundwater) flooding, inundating infrastructure and affecting roads and utilities. The feasibility and cost-benefit of adaptation efforts including road raising, adaptive uses or interim uses leading to long-term managed retreat, and pollution control, should all be considered for Māpunapuna. The Āhua (Lagoon Drive) and Kahauiki (Middle Street) rail stations should be used as a catalyst of any transformative adaptation design solutions.





Shoreline Strategies

Wetland or Lagoon

- Nature-based "living" shoreline restoration; Discourage new impervious surfaces
- ! or
  - Mixed gray-green shoreline engineering
  - Managed retreat

Recreation Area: Natural Shoreline/Beach

- Floodable park areas
- "Living" shoreline restoration efforts
- Ongoing beach/wetland management and restoration Limit new impervious surfaces
- ! or
  - Mixed gray-green shoreline engineering
  - Managed retreat of natural shoreline

Backshore Strategies

SHORT-TERM STRATEGIES	LONGER-TERM OPTIONS
Adapt in Place	Potential managed retreat
Encourage adaptation for developments	Require adaptation for all developments
Plan for deintensification	Greater development regulations/restrictions
Flood and pilot infrastructure projects	District infrastructure raising

Proposed or Conceptual Adaptation Opportunity Projects

- *#5: Moanalua Stream Restoration/Flood Control (West Honolulu Watershed Study, BWS)*
- *#6: Māpunapuna drainage district study (conceptual)*
- *Not shown: SLR pollution abatement study (various south shore industrial sites, conceptual)*
- *#7: Marsh restoration & water quality improvements (various)*
- *#8: Kalihi Kai Stream Restoration/Flood Control (West Honolulu Watershed Study, BWS)*
- *#9: Kalihi Cooling & Resilience Hub (Resilience Strategy, OCCSR)*

CLIMATE CHANGE – LAND USE NEXUS: CARRYING THE WORK FORWARD

AREA ADAPTATION PLANS:
AN INFRASTRUCTURE FIRST APPROACH

Identify near to mid-term in-place adaptation measures:

- Voluntary
- Regulatory

Identify potential City adaptation projects for near-term infrastructure resilience

Identify needed studies and institutional capacity assessments related to:

- Long-term land use planning and infrastructure viability (to 2100)

MAHALO!

Noelle Cole, Department of Planning and Permitting, Noelle.Cole@Honolulu.gov
Integrating Climate Change Topics into the Primary Urban Center Development Plan
Hawai‘i Water Works Association Conference, October 15, 2025