



BARRIERS TO URBAN CLIMATE CHANGE ADAPTATION

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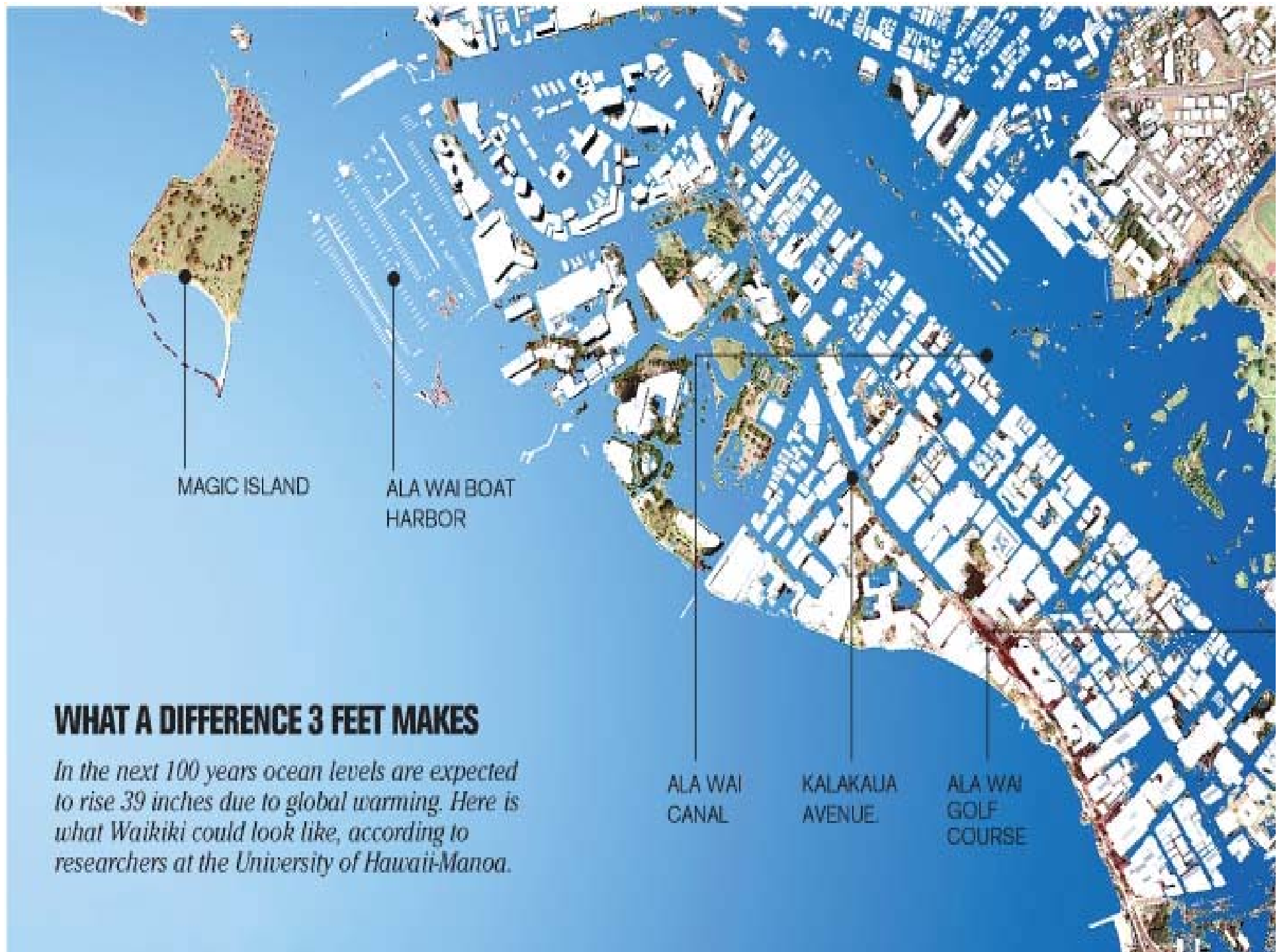
East-West Center

Barriers to Climate Change Adaptation

- “Barriers” are obstacles that arise in the process of developing adaptation strategies such as inadequate technical analysis, inadequate funding, lack of inter-agency consensus about adaptation strategies, etc.
- Some barriers can be overcome through careful process design, creative management, greater effort, changes in understanding, consensus-building, etc.

Climate Change Impacts in Hawaii

- Sea level rise of 6" over the last century; estimates of about 1 ft. by 2050 and 3 feet by 2100
- Increased vulnerability chronic coastal erosion, flooding and drainage problems
- Groundwater intrusion leading to higher water tables and large-scale inundation in low-lying areas
- Saltwater intrusion into groundwater systems, wetlands, estuaries and coastal agriculture
- Probable changes in precipitation levels and patterns
- Probable increased exposure to extreme climate events



MAGIC ISLAND

ALA WAI BOAT
HARBOR

WHAT A DIFFERENCE 3 FEET MAKES

In the next 100 years ocean levels are expected to rise 39 inches due to global warming. Here is what Waikiki could look like, according to researchers at the University of Hawaii-Manoa.

ALA WAI
CANAL

KALAKAUA
AVENUE

ALA WAI
GOLF
COURSE

Kailua Beach Erosion



Kailua Beach Erosion



Coastal Erosion



Maui Coastal Erosion



Flooded Oahu Highway





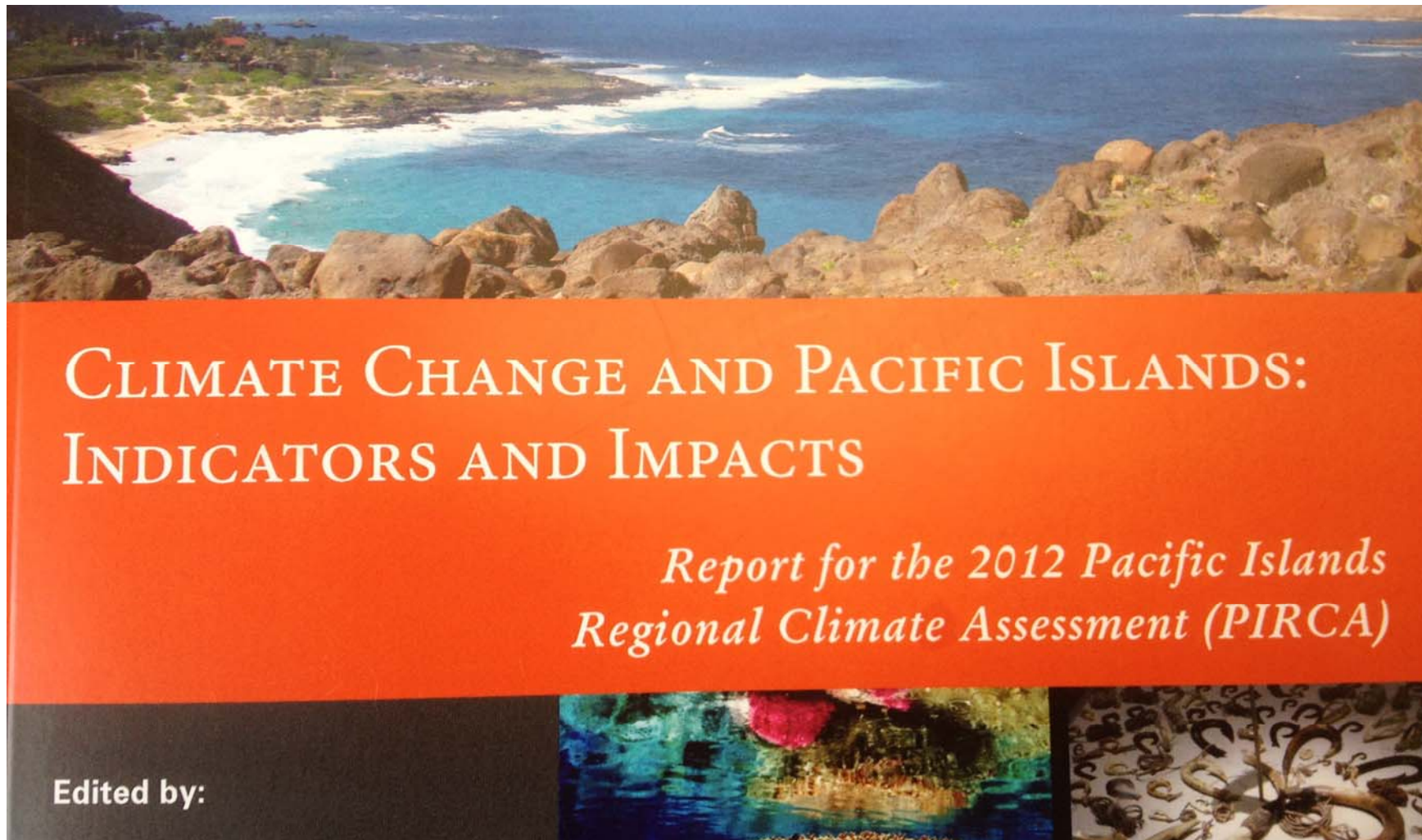


Storm drains
backed up at
high tide.

Status of Climate Adaptation Efforts

- Numerous technical studies focusing on erosion, flooding, ground water intrusion and other impacts
- Numerous workshops, hearings and roundtables
- Legislative enactment of new “priority guidelines” incorporating climate change policy into Hawaii’s state plan
- Introduction of bills to address coastal erosion in county councils
- No other major legislative initiatives

Hawaii Climate Change Impact Analysis



Kahala and Wailupe, Oahu, Hawaii

AREA DESCRIPTION

The beaches of eastern Kahala and Wailupe are on the southern coast of Oahu in Maunaloa Bay, bounded to the west by Wailupe Stream and to the east by Wailupe Peninsula. A stream mouth and several man-made jetties divide the shoreline into seven segments. Waves are typically small (< 1 ft) along all portions of this shoreline. A shallow fringing reef provides shelter from southern hemisphere swells and tradewind swells, which commonly affect this side of the island.

Construction of the Kahala Mandarin Oriental Hotel in 1963 included dredging of a beachfront swimming area; installation of a stone jetty, peninsula, and small island; and filling of the beach with 18,000 cubic yards of sand (Clark, 2005). Due to the man-made alterations to the shoreline, analyses of the Mandarin Hotel beach includes shorelines from 1967-2005, only.

Wailupe Beach Park presently has no beach (stone and mud). A small pocket beach between the beach park and a jetty (transect 111-112) is experiencing slight but not significant erosion at an average rate of -0.16 ± 0.18 ft/yr. The remainder of the beach segments between Wailupe Beach Park and the Mandarin Hotel are separated by short jetties and stream mouth at Wailupe Golf Course. The beach segment containing transects 113-131 is presently accreting at 0.23 ± 0.07 ft/yr, averaged along its length. Transects 132-140 are accreting at 0.40 ± 0.05 ft/yr. Transects 141-173 are accreting at 0.33 ± 0.11 ft/yr. Transects 175-180 are accreting at 0.15 ± 0.11 ft/yr. At the Kahala Mandarin, transects 162-191 are accreting at 0.23 ± 0.14 ft/yr and transects 193-208 are eroding at -0.85 ± 0.21 ft/yr. Previous studies found beaches in this area to be stable or accreting (Hwang, 1981; See Engineering, 1988).

For more information see: <http://www.soest.hawaii.edu/asp/coasts/loahu/index.asp>

Clark, J.R.K. (2005). "Beaches of Oahu." University of Hawaii Press, 190 p.

Hwang, D. (1981). "Beach changes on Oahu as revealed by aerial photographs." State of Hawaii, Department of Planning and Economic Development.

See Engineering, Inc. (1988). "Oahu shoreline study." City and County of Honolulu, Department of Land Utilization.

SHORELINE CHANGE RATES

- Blue line: Accretion Rate
- Red line: Erosion Rate

Historical shoreline positions are measured every 66 ft along the shoreline. These sites are denoted by yellow shore-perpendicular transects. Changes in the position of the shorelines through time are used to calculate shoreline change rates (ft/yr) at each transect location.

Annual shoreline change rates are shown on the shore-parallel graph. Red bars on the graph indicate a trend of beach erosion, while blue bars indicate a trend of accretion. Approximately every fifth transect and bar of the graph is numbered. Where necessary, transects have been purposely deleted to maintain consistent along-shore spacing. As a result transect numbering is not consecutive everywhere.

The EX method is used to calculate shoreline change rates for the study area. The rates are smoothed along shore using a 1-3-5-3-1 technique to normalize rate differences on adjacent transects. For more information on erosion rate methods and results see: <http://www.soest.hawaii.edu/asp/coasts/loahu/index.asp>

HISTORICAL SHORELINES

- Yellow line: T-sheet 1925
- Orange line: 1927
- Red line: Oct 1949
- Dark red line: Apr 1967
- Green line: Jan 1971
- Light green line: Apr 1975
- Blue line: Feb 1988
- Purple line: July 1996
- Dark purple line: Dec 2005

Erosion rate measurement locations (shore-normal transects)

Historical beach positions, color coded by year, are determined using orthorectified and georeferenced aerial photographs and National Ocean Survey (NOS) topographic survey charts. The low water mark is used as the historical shoreline, or shoreline change reference feature (SCRF).

Movement of the SCRF along shore-normal transects (spaced every 66 ft) is used to calculate erosion rates.

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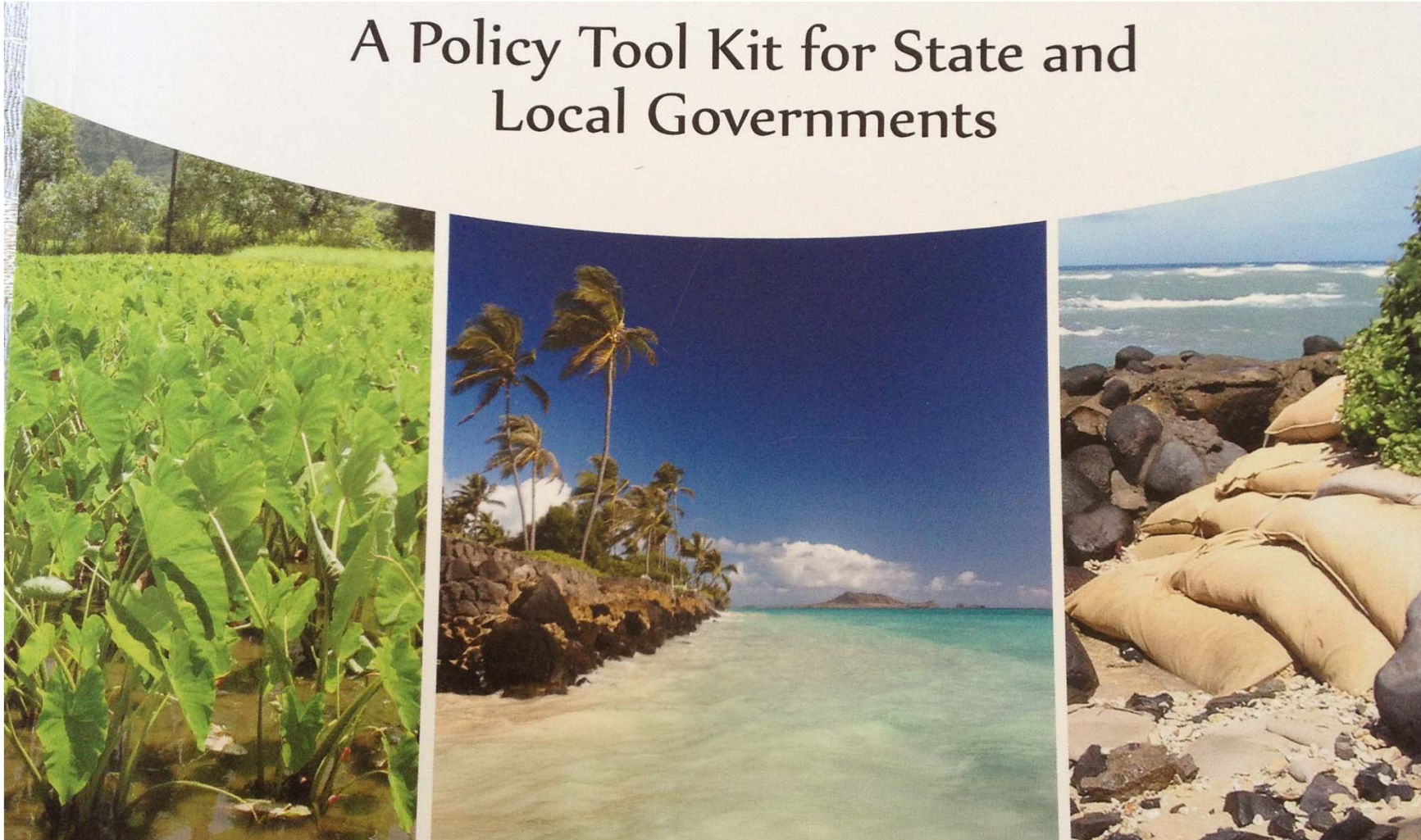
100 0 100 200 300 400 Meters
300 0 300 600 900 1200 Feet

Oahu

Kahala & Wailupe

ICAP Sea Level Rise Adaptation Tools Report

A Policy Tool Kit for State and
Local Governments



Conventional Image of Adaptation Strategy Development Process



Adaptation Strategy Development Barriers in Hawaii

Identify Impacts

- Uncertainty about timing, certainty and severity of particular climate change impacts
- Lack of confidence in some technical analysis
- Little community pressure to address potential impacts

Identify Adaptation Options

- Some fear of political costs of increased intervention
- Lack of agreement about types of needed options
- Lack of agreement about information needed for management of impacts

Evaluate Adaptation Options

- Lack of agreement about evaluative criteria
- Inadequate methods to compare options
- Uncertainty about capacities of key implementing institutions

Strategies for Dissolving Barriers

- *Joint fact-finding*---stakeholders agree on an analytic process [or analysts] to address an empirical issue such as adaptation costs
- *Collaborative planning*--key stakeholders meet—often with convener/facilitator—to resolve barriers]
- *Development of epistemic communities*—networks of scientists, policy specialists, policy advocates and others
- *Use of boundary organization[s]*—scientists, technical experts, and policy specialists working together to translate technical analysis into forms usable by policy-makers

Four Functions of Boundary Organizations

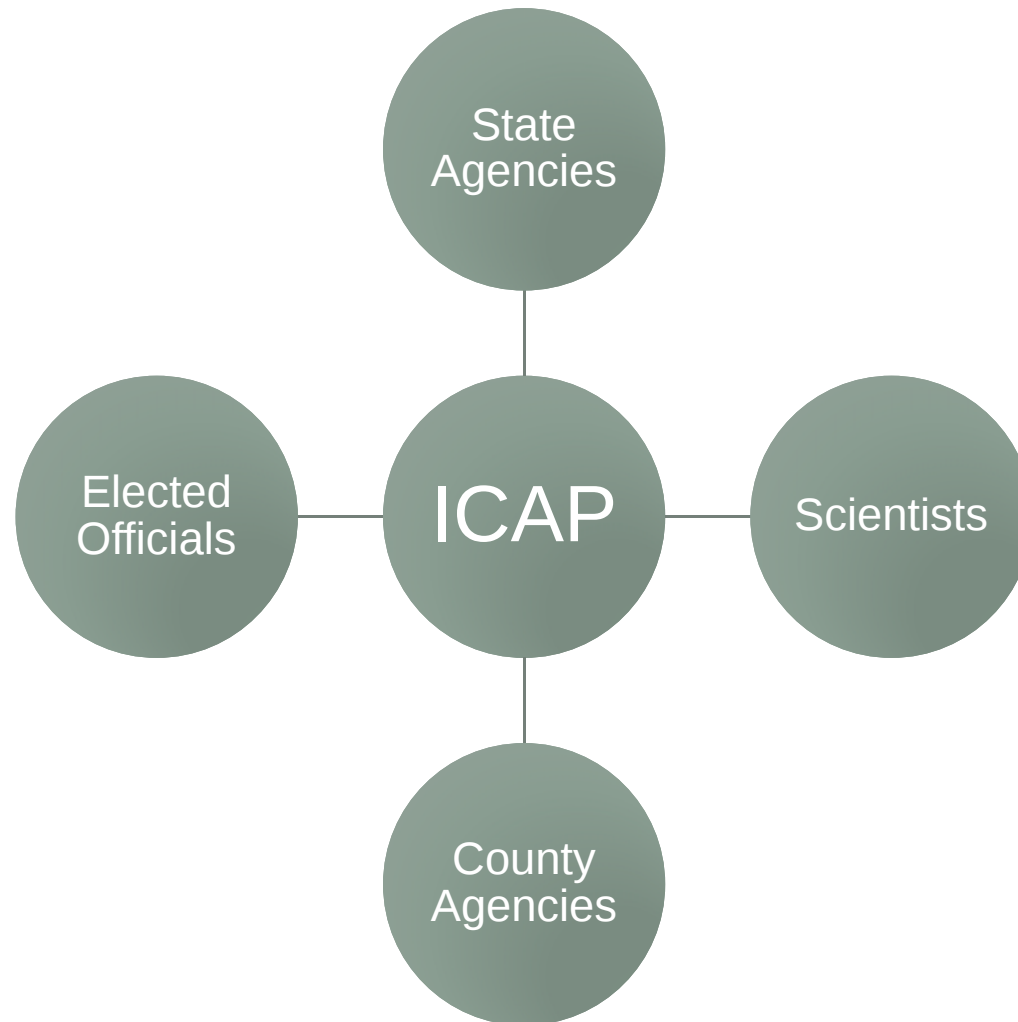
- *Convening*—bringing stakeholders together for face-to-face contact to foster trust-building
- *Translation*—making technical information comprehensible for policy-makers and implementing organizations
- *Collaboration*—insuring co-operating organizations can be brought together for frank and transparent dialogue to create potentially effective working relationships
- *Mediation*—assure that various interests of stakeholders, information producers and users are fairly represented.

[Source: Tribbia and Moser, 2008]

Hawaii's Center for Island Climate Adaptation and Policy

- Established at University of Hawaii in 2008
- Engages technical experts, legal experts and others to examine adaptation issues
- Conducts or coordinates technical, policy and legal research on climate change adaptation issues
- Convenes workshops of elected officials, agency staff, technical experts, legal experts and others to deliberate on climate adaptation issues
- Raises funds to support research, workshops, consultations

Boundary Organization to Address Adaptation Barriers in Hawaii



ICAP as Boundary Organization

- Generated funds to convene on-going meetings with state Office of Planning staff and planning department staff from each of four counties
- Met monthly over 14 month period to exchange views about priority climate change impacts and possible adaptation options
- Led deliberations about technical, legal, political and other barriers to choosing and implementing adaptation options
- Conducted technical and legal research on issues identified by stakeholders
- Generated a major report, fact sheets and other information
- Continue to meet and deliberate

Addressing Adaptation Barriers

Barrier: Uncertainty about timing, certainty and severity of particular climate change impacts.

- Agreement: Focus on highly certain impacts including coastal erosion and flooding

Lack of confidence in some technical analysis.

- Agreement: Focus on impacts for which confidence in research is high including coastal erosion.

Addressing Adaptation Barriers/2

Barrier: Fear of political costs of increased intervention.

- Agreement: Technical staff meet with elected officials; emphasize costs of no action
- Agreement: Focus on “low regrets” options

Barrier: Lack of agreement about types of needed options.

- Agreement: Making primary adaptation emphasis on planning and other “low regrets” options.

Addressing Adaptation Barriers/3

Barrier: Little community pressure to address potential impacts.

- Agreement: Design and implement pilot community-level vulnerability assessments.

Lack of agreement about evaluative criteria.

- Agreement: Focus on low cost, “no regrets” measures implemented by existing institutions.

Some Observations about Addressing Adaptation Barriers

- Take great care in identifying and getting consensus about barriers.
- Consider the utility of a “boundary organization” or other outside means to assist in addressing barriers.
- Develop trust by identifying and implementing “no regrets”, “low regrets”, reversible and other adaptation measures to address climate issues for which there is high quality technical data and agreement about issue immediacy.
- Implement through existing institutions.
- Incorporate group learning strategies into the implementation process



PAU
