

# IMPACTS OF EROSION, HIGH WAVES, & SEA LEVEL RISE ON INFRASTRUCTURE

Maui County Council EACP Committee  
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22.2015



South Kihei Road, January 2017

RECEIVED AT EACP MEETING ON 2/12/19<sup>1</sup>

Tara Owens











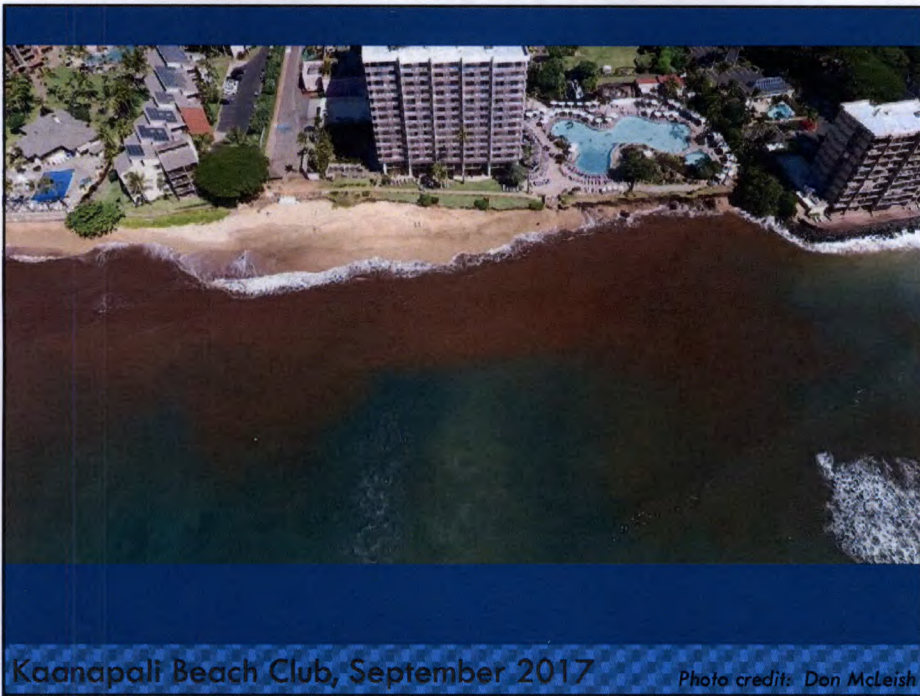


Honoapiilani Highway, - January 2013

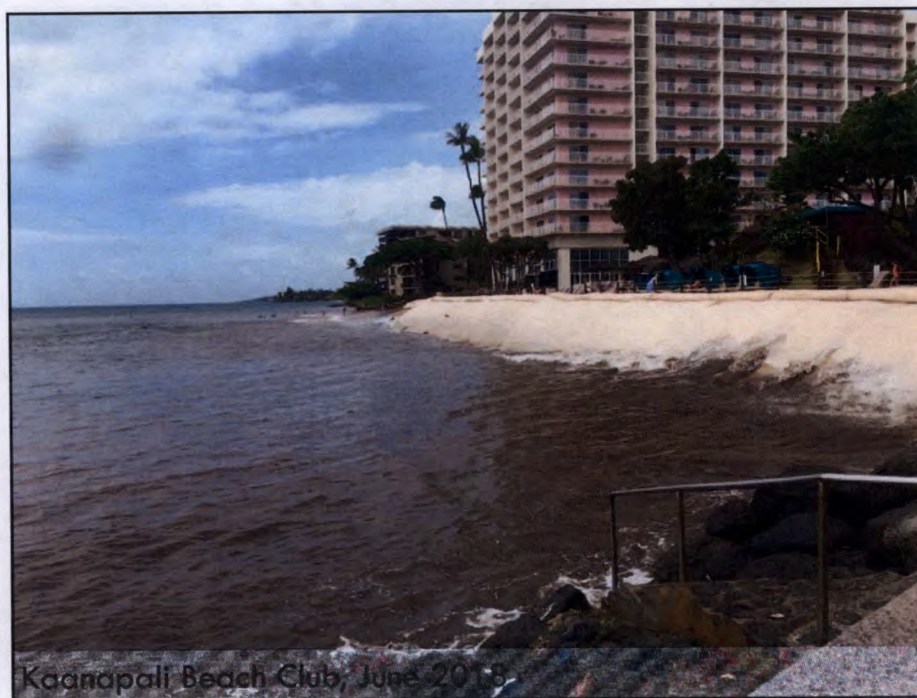


Honoapiilani Highway, Ukumehame, June 2017 Photo credit: Asa Ellison





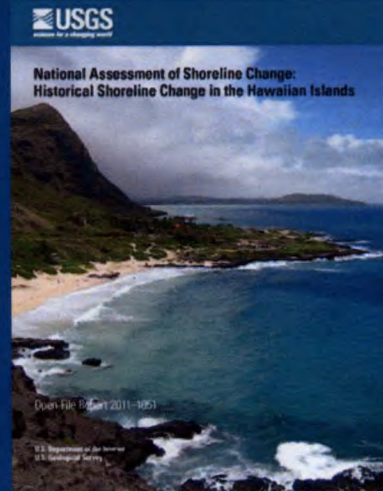






# EROSION IS WIDESPREAD ON MAUI

- 85% of Maui shorelines are eroding over the long-term.
- Maui's beaches are experiencing the highest rates of erosion for the Hawaiian islands.
- Maui has the highest percentage of beach loss (11%).



Fletcher, Charles et. al., 2011. *National Assessment of Shoreline Change: Historical Shoreline Change in the Hawaiian Islands*. U.S. Geological Survey Open-file Report 2011-1051, 55p.

# EROSION MAPS





## CONTRIBUTIONS TO EROSION

Combination of:

1. Sea-Level Rise  
*(chronic erosion)*
2. Seasonal Wave  
Conditions & Storms that  
Move Sand  
*(episodic erosion)*
3. Human Interventions –  
seawalls, revetments, and  
sand mining



## A GLIMPSE OF THE FUTURE

**Today's King Tide = Tomorrow's Average Water Level**

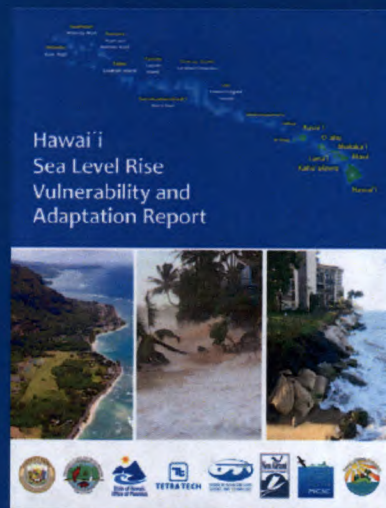


Honoapiilani Hwy, Olowalu MM14, May 2017 photo credit: Asa Ellison



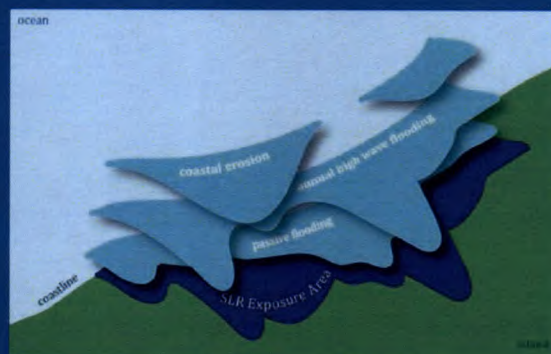
## HI CLIMATE CHANGE MITIGATION & ADAPTATION INITIATIVE

- Act 32 (2017); building on Act 83 (2014)
- Initial focus – To develop the Hawaii Sea Level Rise Vulnerability and Adaptation Report
  - Adopted December 2017 by the State Climate Commission
  - Assesses vulnerabilities to coastal hazards with sea level rise.
  - Provides recommendations for improving hazard resilience.



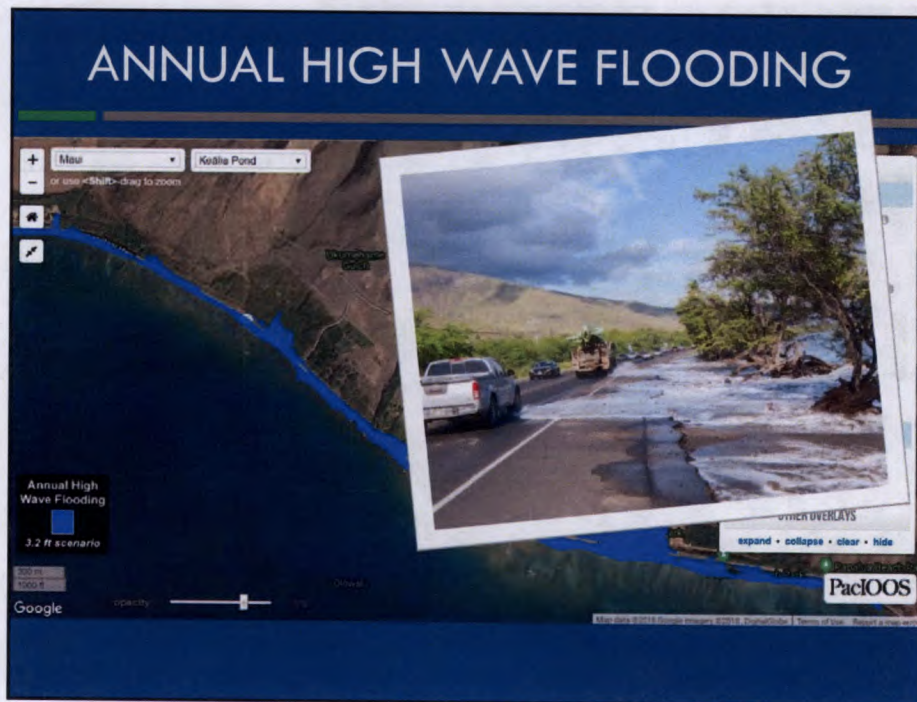
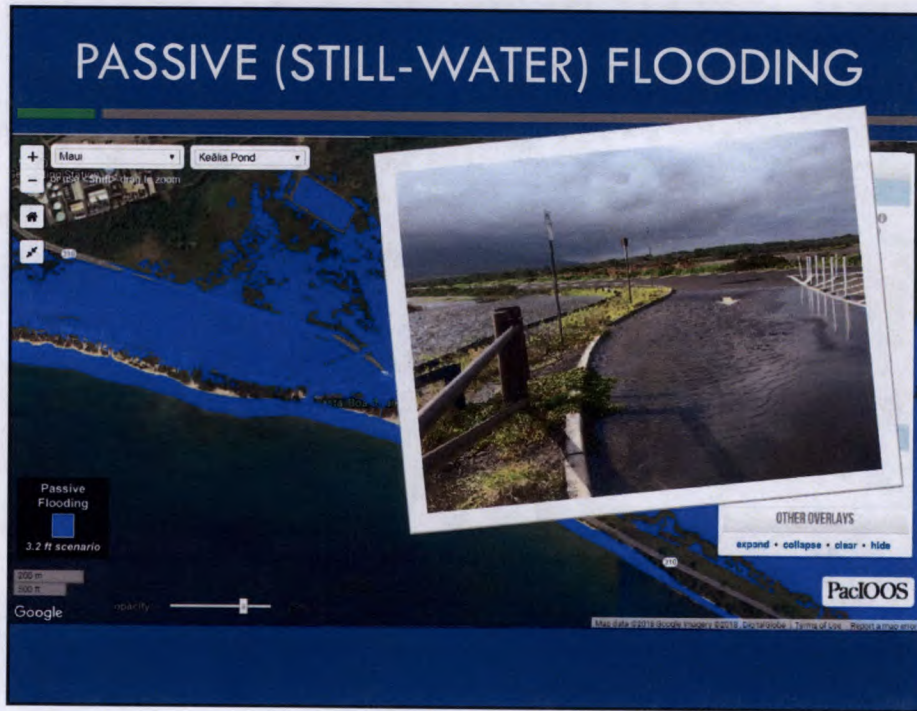
## MODELING SEA LEVEL RISE EXPOSURE

- The SLR report considers:
  - 1 ft of SLR as the present to near-term scenario;
  - 3.2 ft of SLR as the scenario for the second half of this century
- Recommendation: Plan for 3 ft now!

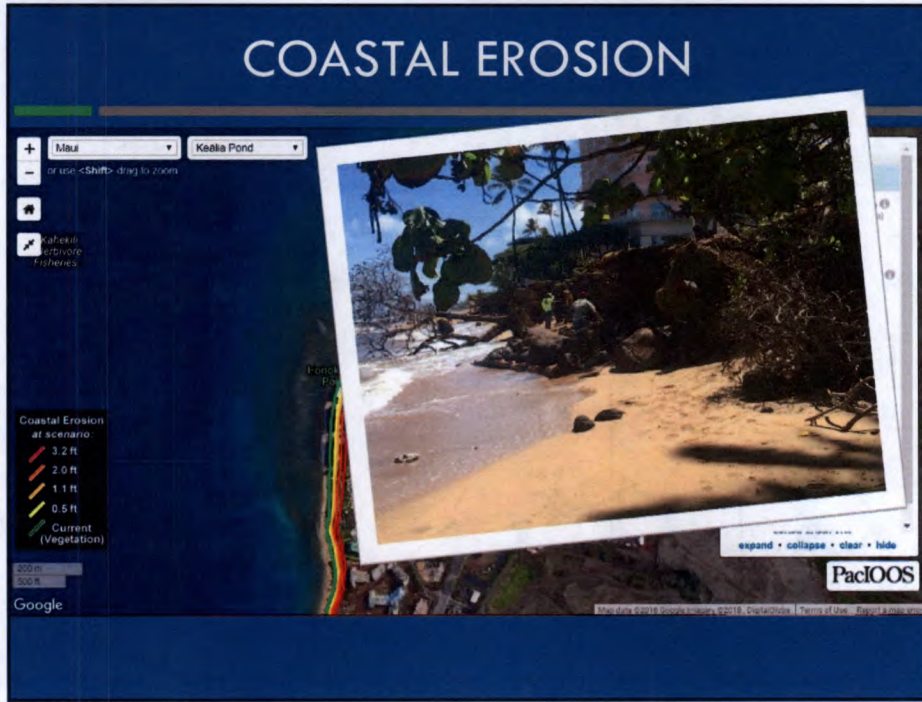


The Sea Level Rise Exposure Area (SLR-XA)

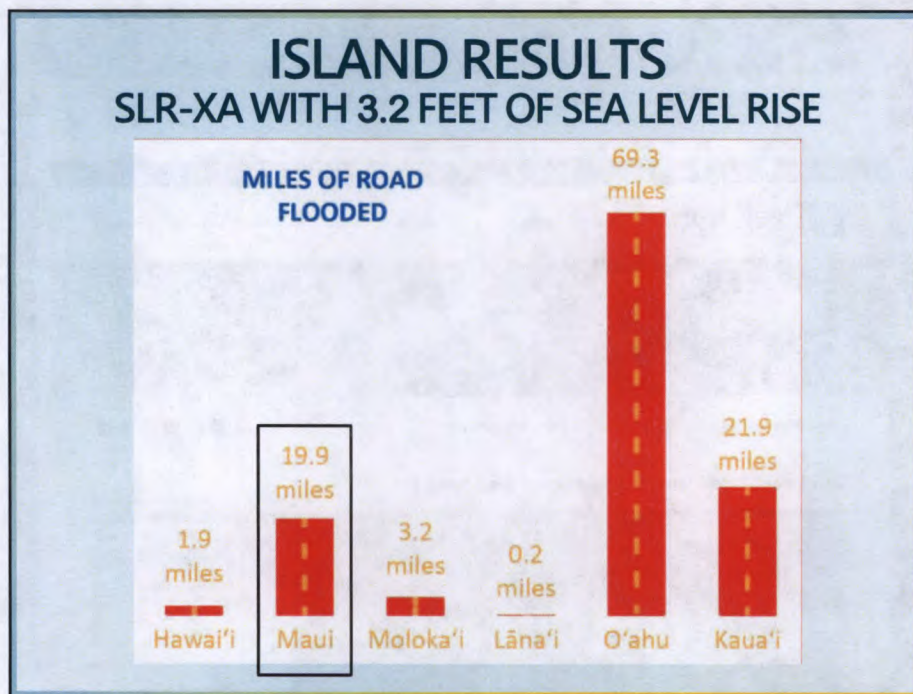
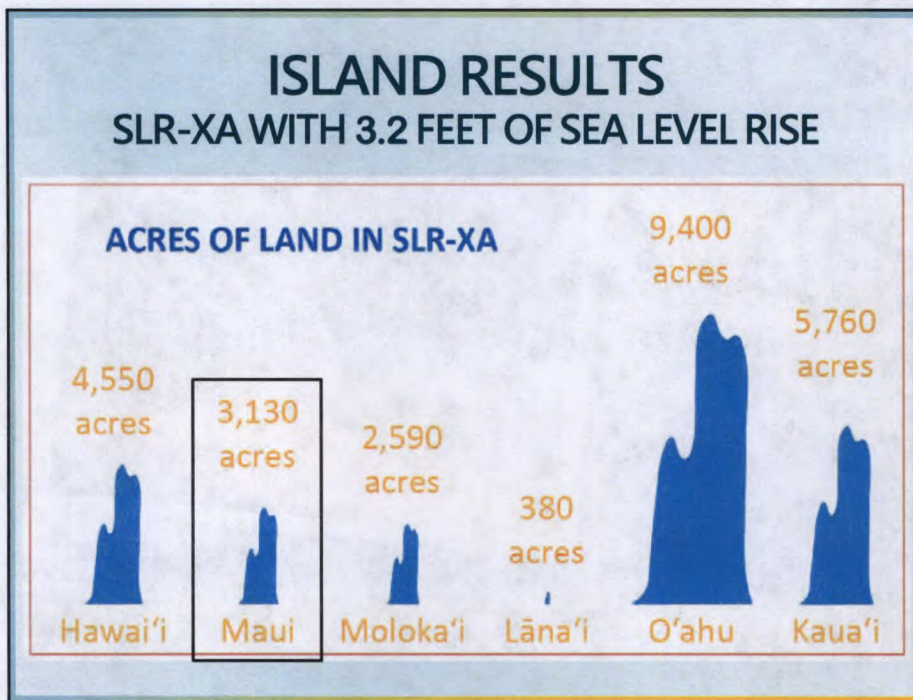




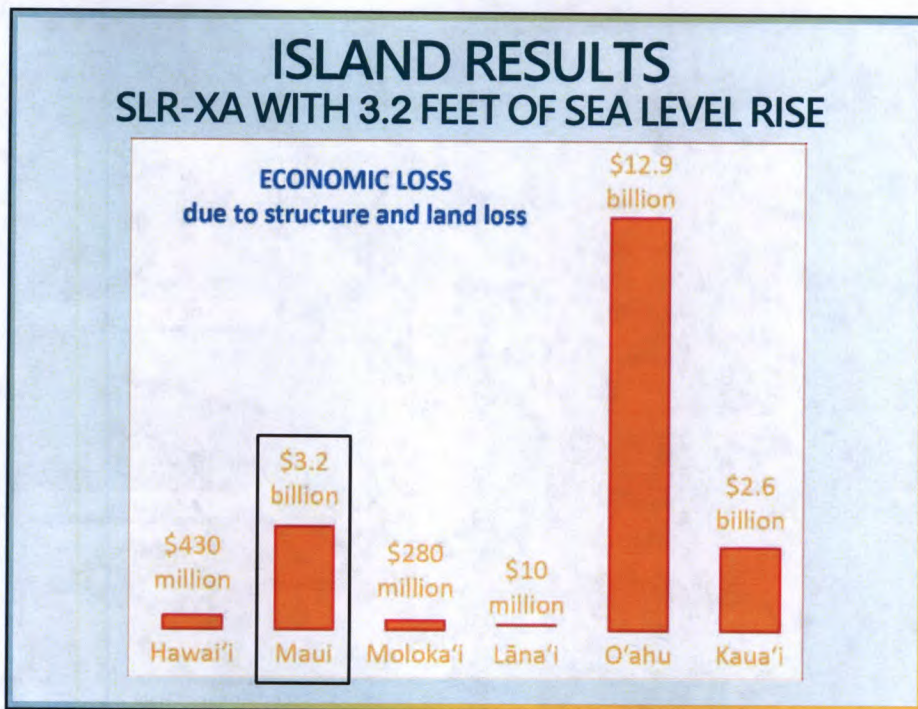












## WEST MAUI COMMUNITY PLAN

- Planning Strategies:
  - Conduct detailed vulnerability assessments for existing critical infrastructure
  - Commission additional sea level rise modeling for 6 ft of sea level rise for critical infrastructure
  - Integrate sea level rise into capital improvement planning for public facilities
  - Inventory wastewater systems affected by sea level rise





## RESPONSE OPTIONS

preferred strategies

- Do nothing
- Managed retreat (*setbacks, relocation*)
- Adaptation (*elevate, reconfigure*)
- Beach nourishment and/or Dune Restoration
- Temporary erosion control (*sand pushing, natural or geotextile bags, erosion blanket*)
- Armoring (*permanent rock revetment or seawall*)



Do Nothing



Adaptation



Armor / "Hold the Line"

## MAUI'S SHORELINE SETBACKS

$$(50 \text{ yrs} \times \text{AEHR}) + 25 \text{ feet}$$

1. life expectancy of structure

2. historical erosion

3. minimum setback

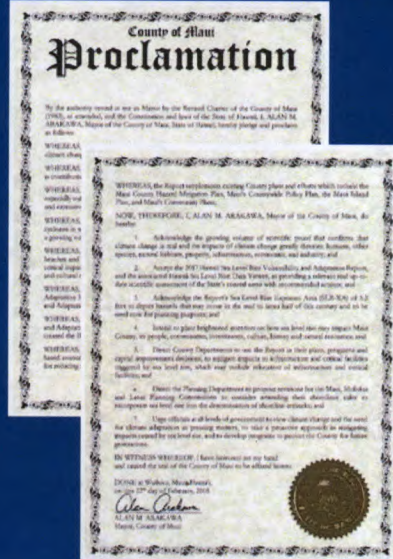
Opportunity to Refine:  
future Sea Level Rise is not part of the formula



# MAYOR'S SLR PROCLAMATION

“NOW, THEREFORE, I, ALAN M. ARAKAWA, Mayor of the County of Maui, do hereby:

6. Direct the Planning Department to propose revisions for the Maui, Molokai, and Lanai Planning Commissions to consider amending their shoreline rules to incorporate sea level rise into the determination of shoreline setbacks.”



# CRITICAL INFRASTRUCTURE ARMORING



Wailuku-Kahului Wastewater Facility, circa 2011



## CRITICAL INFRASTRUCTURE ARMORING



*Image: Goodfellow Brothers*

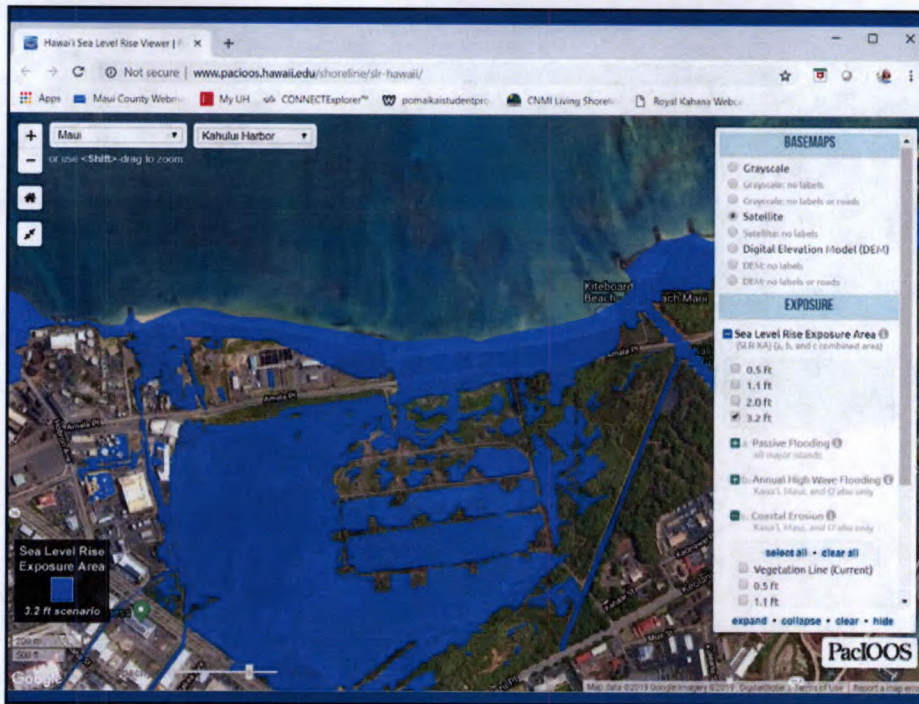
Wailuku-Kahului Wastewater Facility, 2015

## MITIGATION: DUNE RESTORATION



Wailuku-Kahului Wastewater Facility, 2016





## PROTECT & RESTORE DUNES

**Seasonal beach profile adjustments**

**Normal beach profile**  
Dunes, Beach

**Adjustment for large waves**  
Dunes and beach release sand → Sand moves offshore

**Recovery**  
New dunes  
Coastal dunes and beach store sand until next large wave event ← Sand moves onshore

**Large waves, which tend to occur seasonally in Hawaii, cause a beach to temporarily change its profile.**

degraded dunes

healthy dunes

Kamaole I Beach Park









## SHORELINE ACCESS BOARDWALKS





## CONCLUSION

1. Council's Role and Authority in Coastal Management
  - o County Charter Section 8-8.4 – Authorizes the three Planning Commissions for SMA and Shoreline Area Permits
  - o Primarily Funding and Legislation
2. Council Accomplishments
  - o Sea Level Rise Resolution (18-160)
  - o Kahana Bay Sand Study
  - o SMA Revolving Fund
  - o Community Facilities District ordinance
3. Proactive Planning

## Mahalo Nui Loa

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