NOAA Coastal Storms Program
Research, Planning, and Policy to Support Sea Level Rise Adaptation in Hawai‘i
NOAA Coastal Storms Program provides services and funding to reduce the loss of life and negative impacts of coastal hazards and climate change with emphasis on projects that support:

- **Focus Area 1:** Integration, Outreach and Training
- **Focus Area 2:** Observations, Modeling and Forecasting
- **Focus Area 3:** Vulnerability & Risk Assessment and Planning Tools

Pacific Islands Coastal Storms Program was established in 2011 as a 3-5 year effort to help Hawai‘i and U.S. affiliated Pacific Island states with coastal hazard mitigation and climate change adaptation.

- Partnership with the University of Hawai‘i Sea Grant College Program
- Coastal Storms Program Coordinator hired in 2011
- $4.46 million invested in data, modeling, tools, and training
- $1 million in small grants for seven projects since 2011
- Supported projects in Hawai‘i, Guam, RMI, and Micronesia

http://seagrant.soest.hawaii.edu/noaa-coastal-storms-program
Focusing on Sea Level Rise

• Pacific Island states are particularly vulnerable to sea level rise due to a variety of factors (geography, economy, topography…)

• Sea level has risen over the last century on each island at rates varying from **0.5 to 1.3 inches** (1.3 to 3.3cm) per decade

• Rates are projected to accelerate, resulting in approximately **1.0 to 3.0 feet** (0.3 to 1.0 m) of rise, or more, by 2100
THE INUNDATION BLUES

About 10 percent of the land within 3,280 feet of the ocean is flooded between Kakaako and Kapahulu in this scenario, which envisions a 1-meter or 3.3-foot sea level rise by the end of the century.

Total flooded areas including groundwater inundation
- +0.66 m sea level rise
- +1.0 m sea level rise

Source: University of Hawaii
Honolulu Sea Level Rise Study was completed in 2014. The goals of this study were to:

• Model and map the potential impacts of future sea level rise in the urban corridor of Honolulu,
• Develop GIS overlay maps of economic impacts of inundation of critical infrastructure in the inundation zone;
• Conduct a combined multi-hazard risk assessment for socio-economic, infrastructure, and transportation assets.
Methodology

1. Hazard identification
2. Hazard analysis mapping
3. Critical facilities vulnerability analysis
4. Social vulnerability analysis
5. Economic vulnerability analysis
6. Environmental vulnerability analysis
7. Mitigation opportunities analysis

* Based on NOAA Coastal Services Center Community Vulnerability Assessment Tool (CVAT)
Modeling Approach

Combined input from multiple inundation models to model flow depth and velocity to create a composite GIS-map for worst-case scenario inundation events under 1 meter of SLR:

1. Storm surge (Category 4 hurricane)
2. Tsunami inundation (5 historical; 5 hypothetical)
3. Riverine flooding (500-year flood)
Storm surge heights for Category 4 hurricane

Significant wave heights for Category 4 hurricane
Hurricane Inundation with 1 meter Sea-Level Rise

Map Contents
- Storm Surge +1m SLR

Depth (m):
- 0 - 0.7
- 0.7 - 1.4
- 1.4 - 2.1
- 2.1 - 5.4
- 5.4 - 10.0

Miles
0 0.5 1 1.5 2 2.5 3

North
Tsunami Inundation
with 1 meter Sea-Level Rise

Map Contents
Tsunami Inundation (1m SLR)

Depth (m)   | 0.6 - 1.0 | 0.6 - 1.0 | 1.0 - 1.5 | 1.5 - 2.1 | 2.1 - 4.3
---|---|---|---|---|---
Color       | Blue | Light Blue | Green | Yellow | Red

0 0.5 1 2 3 Miles
Multi-Hazard Inundation with 1 meter Sea-Level Rise

Map Contents
- Major Streets
- 1 m Sea Level Rise
- Tsunami +1 m SLR
- Storm Surge +1 m SLR

Legend:
- 0 0.5 1 2 3 Miles
- N
Findings: Socioeconomic Vulnerability

- 80% of the economy ($34.8 billion) exposed to the combined hazard
- 87% of the tourism economy ($2.8 billion) exposed to some flooding
- 76% of jobs (212,746) exposed to the worst-case inundation scenarios
- 45% of the total project population exposed to some inundation
Findings: Socioeconomic Vulnerability

- Flood risk by parcel is most significant from 1 - 5ft of flood depth
- Largest cumulative flooding impact from 1.0 - 3.2ft (0.3 - 1.0m)
- Less than 5% of grid cells are flooded beyond 2.5m (~8ft)
- Exposure decreases after 8ft for all sectors of the economy
Findings: Infrastructure Exposure

• 65% of total building value exposed to flooding
• 55% of land building value exposed to flooding
• 69% of roadways and 44% of highways exposed to flooding
• 221.20 miles of arterial streets exposed to flooding
• Arterial roads are significantly more exposed
Applications and Next Steps

• Hazard mitigation planning (tsunami evacuation maps)
• Post-disaster recovery planning
• Land use planning (Kakaʻako)
• Infrastructure management (Ala Wai Canal)
• Beach management (Waikīkī)
• Hawaii Climate Adaptation Initiative
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