SEA-LEVEL RISE COASTAL INUNDATION RISK AND VULNERABILITY ASSESSMENT FOR HONOLULU, HAWAII.

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Honolulu SLR Inundation Study

SCOPE OF WORK:

Mapping:
1. SLR scenarios mapped at 1 meter (3.2 ft).
2. Map and identify critical infrastructure located in these hazard zones.

Modeling:
3. Hurricane: Model hurricane storm surge inundation under higher sea level projections (future hazard zones).
4. Tsunami: Model tsunami inundation under higher sea level projections (future hazard zones).
5. Riverine flooding (500 year event).

Assessment:
7. Transportation analysis.

The study follows a 7 step formula described by the NOAA Coastal Services Center (CSC):
1) Hazard Identification,
2) Hazard Analysis Mapping,
3) Critical Facilities Vulnerability Analysis,
4) Societal Vulnerability Analysis,
5) Economic Vulnerability Analysis,
6) Environmental Vulnerability Analysis, and
7) Mitigation Opportunities Analysis.
Honolulu SLR Inundation Study

Critical Facilities Inventory and Socio-Economic Impact Assessment

• GIS overlay maps of economic impacts of inundation of critical infrastructure in the inundation zone for hazard zone overlay.

• Combined risk assessment for Honolulu; (socio-economic, infrastructure, and transportation assets).

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7) Mitigation Opportunities Analysis.
Multi-hazard Perspective

Combined output from four inundation models:
SLR+ Tsunami + Hurricane + Flooding
1. Sea Level Rise of 1 meter
2. Storm surge due to simulated Category 4 storm
3. Simulated maximum inundation based on five major historical tsunamis in Hawaii.
4. 500 Year return period for inland riverine flooding

GIS – composite hazard map
Methodology

1992 Hurricane Iniki approach into Honolulu

Storm Surge Heights (feet)
Results

1992 Hurricane Iniki approach into Honolulu

Storm Surge  Significant Wave Height
1992 Hurricane Iniki approach into Honolulu
Snapshots of simulated surge and waves for hurricane landfall in Honolulu.

+1m MSL
Honolulu SLR Inundation Study

HURRICANE Storm Surge Current Conditions (+3 ft SLR)
Honolulu SLR Inundation Study
Combined Risk Assessment

Critical Facilities Inventory and Socio-Economic Impacts

- Inundation hazard zones
- Critical infrastructure
- Socio-economic vulnerability
- Transportation systems

- Produce GIS-compatible overlay maps of economic output and impacts of SLR to critical infrastructure in the coastal high hazard zone for incorporation into hazard zone overlay.

- Combined risk assessment for Honolulu; (socio-economic, infrastructure, and transportation assets).
Honolulu SLR Inundation Study
Predominant Hazard

Critical Facilities Inventory and Socio-Economic Impacts

Map 8: Ruling Hazard with 1m Sea Level Rise

Legend
- Neighborhood Boundary
- Ruling Hazard: 1m SLR
  - Hurricane Storm Surge
  - Riverine Flooding
  - Tsunami Runup

0 0.275 0.55 1.1 1.65 2.2 Miles
Economics

- $34.8 Billion or 80% of the study area economy is exposed to the modeled combined hazard.
- 87% of the tourism sector economy ($2.8 billion) is subject to some flooding.
- Flood risk by parcel for land use development is most significant between 1ft and 5ft of flood depth.
- The exposure rate decreases after 8 feet for all sectors of the economy.
- Largest cumulative flooding impact (~20%) occurs between .3m and 1.0 m (1 ft to 3.2ft).
- Less than 5% of grid cells are flooded beyond 2.5 m (~8ft) of flooding.

Transportation

- The length of local streets exposed to flooding is 221.20 miles
- By percentage, arterial roads are significantly more exposed compared to other road types.
- Freeway 18.68 miles, Arterial roads 17.73, highway 14.24 miles

Population

- 45% of the total project population percentage is exposed to some inundation.
Aloha and Mahalo!
Coastal Inundation Mapping - So now what?

Opportunities and Outcomes:

• Kakaako Master Plan and opportunity to integrate Smart growth, hazard mitigation and climate adaptation simultaneously.

• ICAP-CREST SLR policy planning study- Great interest in pilot study in Kakaako and/or Waikiki.

• Outcomes – Strengths and weaknesses
  Strengths- Science-based with robust and highly accurate validated computer models.

  Weakness- outcomes and actions based on maps. Economic component will provide justification and motivation for implementation of strategies.

Application-Working with U.S.ACE on drainage assessment and alternative adaptation measures.
  Storm-water drainage.
  Subsurface utilities and structures
  Need better understanding of ground-water
22 towers dot plan for Ward Centers

Howard Hughes Corp. envisions redeveloping nearly the whole Ward Centers area with 22 residential towers and twice as much retail, restaurants and entertainment venues.

The new plan, dubbed Ward Village, would double the amount of retail, dining and entertainment venues on their property. It also calls for 22 skinnier towers that preserve more public views of the mountains and ocean compared with General Growth’s plan for 20 towers.

Another major plan revision is the intention by Hughes Corp. to orient the long side of nearly all its towers on a mauka-makai axis to further maximize public mountain and ocean views between buildings.

Eight towers still would front Ala Moana Boulevard, but they would be set back 60 to 70 feet from the street instead of 15 feet, according to Nick Vanderboom, Hughes Corp. vice president of development.