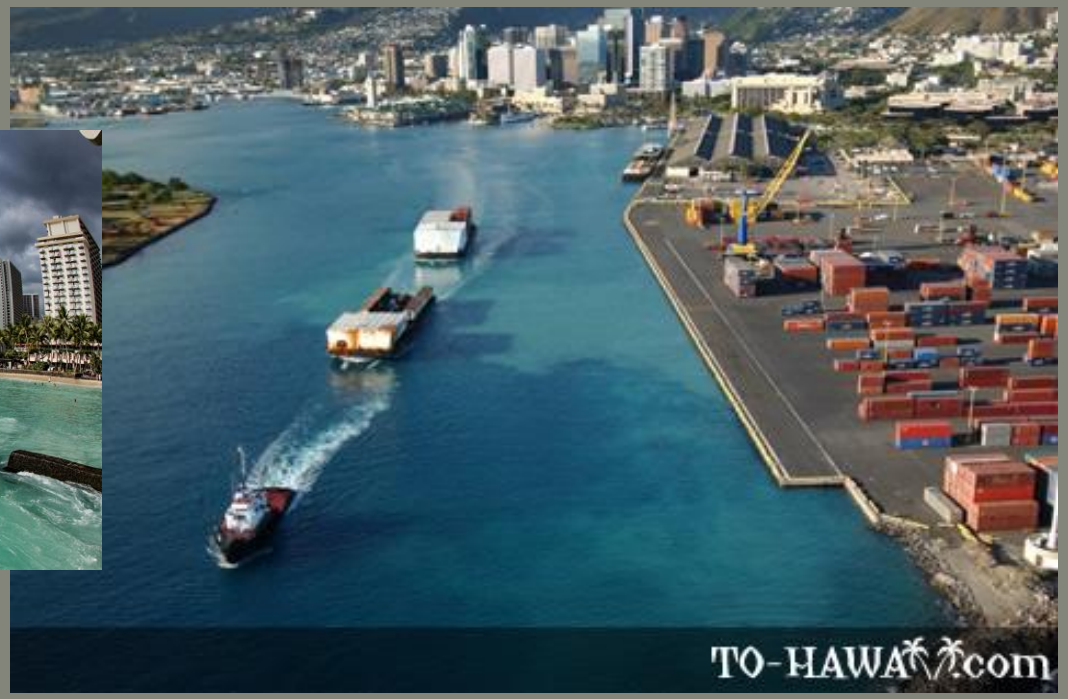
SEA LEVEL CHANGE CONSIDERATIONS FOR NAVIGATION AND COASTAL STORM DAMAGE REDUCTION PROJECTS IN THE STATE OF HAWAII



Justin Goo, P.E.
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TOPICS

Climate Change in the Pacific Region

Case Studies for Resilient Design:

- Hilo Harbor, Island of Hawaii –Breakwater Repair Incorporating Resilience to Sea Level Rise
- Waikiki Regional Sediment Management Project
- Honolulu Harbor Navigation Modification Study

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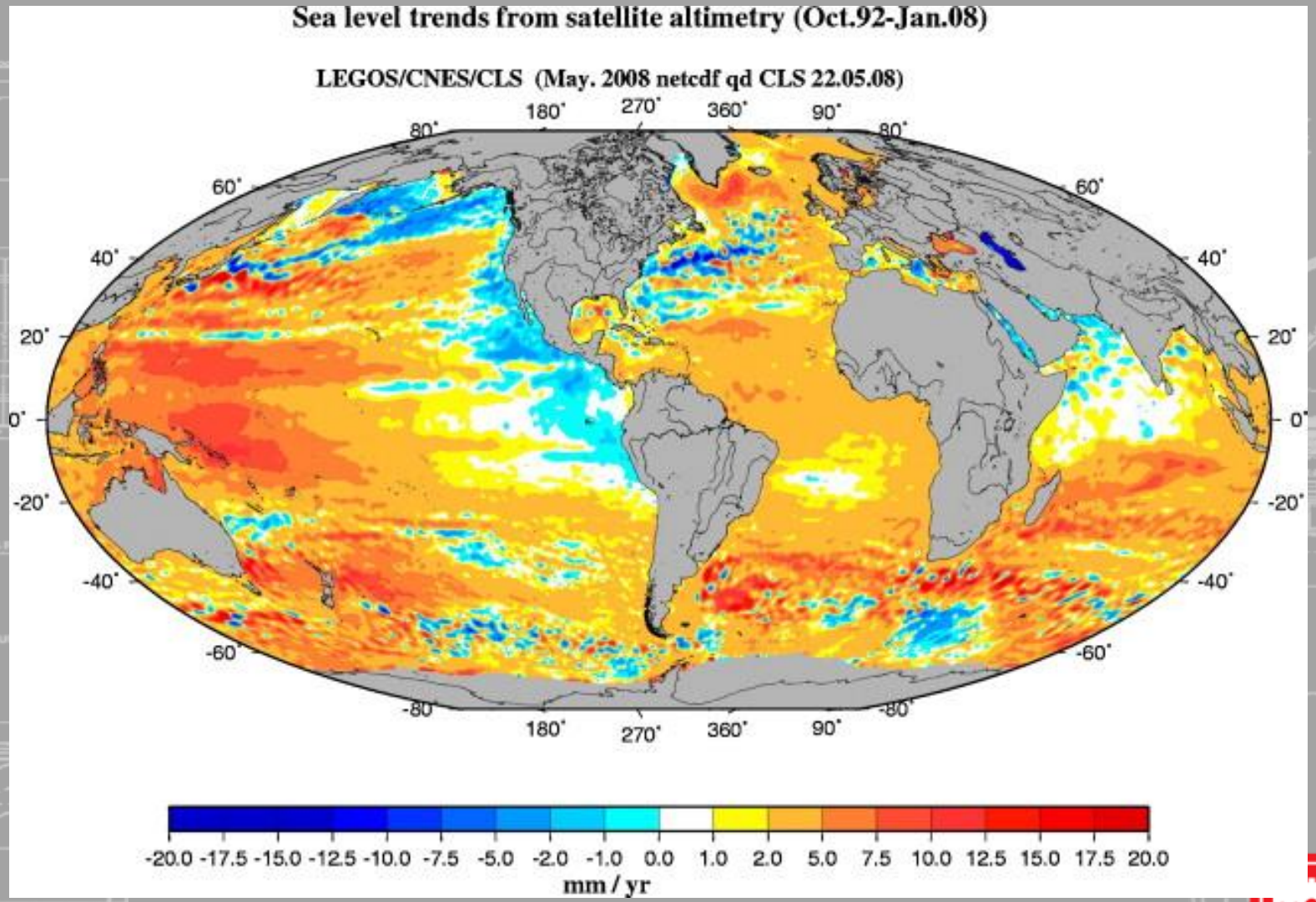
CLIMATE CHANGE IN THE PACIFIC REGION



Recent trends: Western Pacific Sea Level Rise (SLR) is 2 to 3 times the global average

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CLIMATE CHANGE IN THE PACIFIC OCEAN

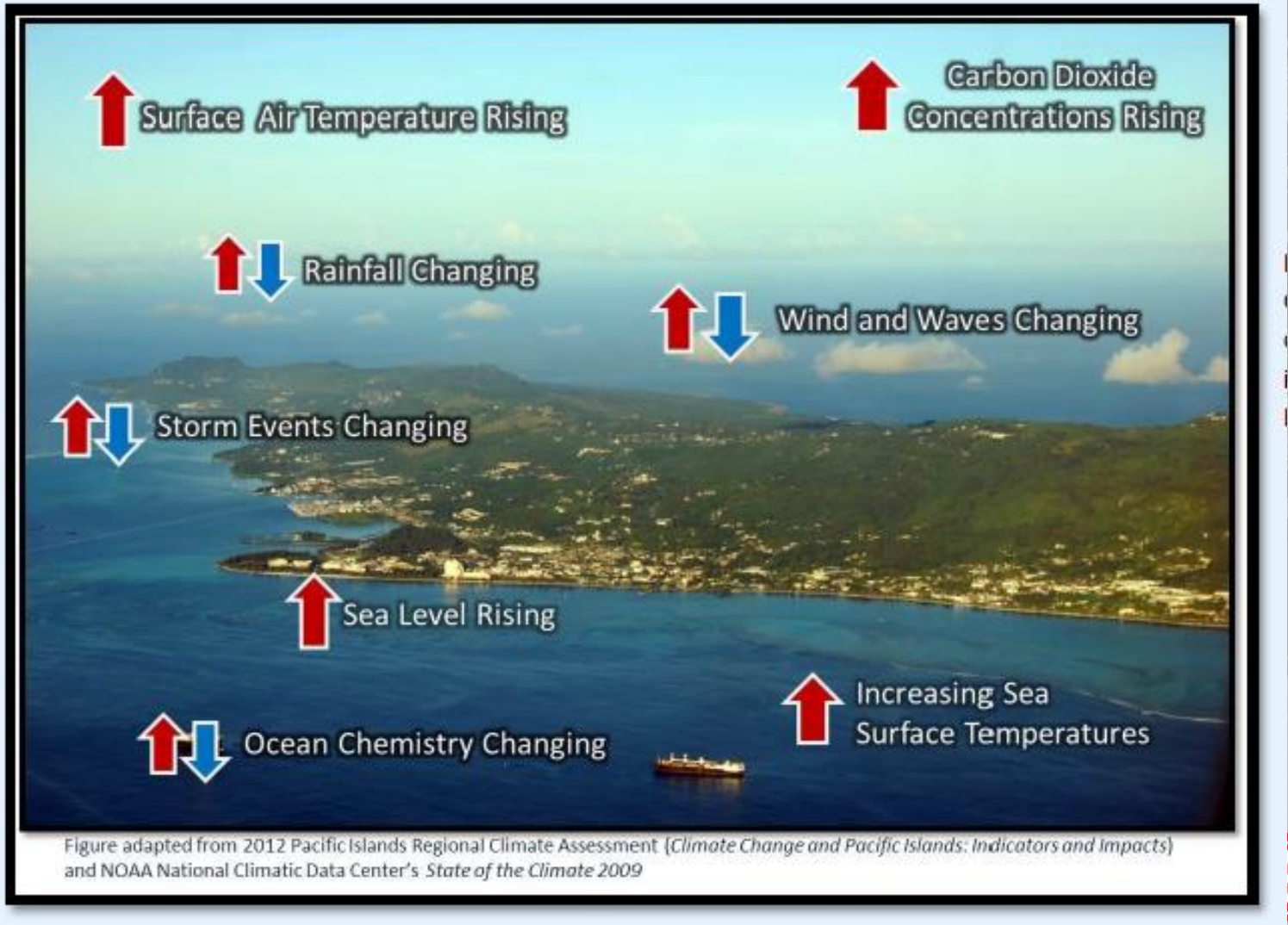

Figure adapted from 2012 Pacific Islands Regional Climate Assessment (*Climate Change and Pacific Islands: Indicators and Impacts*) and NOAA National Climatic Data Center's *State of the Climate 2009*

From Climate Change Vulnerability Assessment for the Island of Saipan, CNMI (January 2014)

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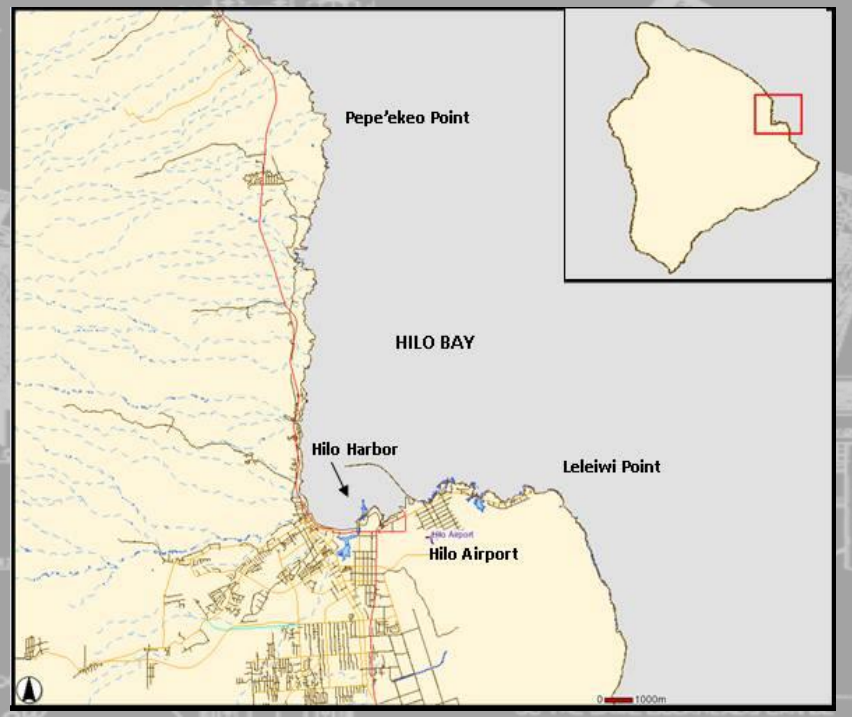
Case Study 1: Hilo Harbor Breakwater, Island of Hawaii



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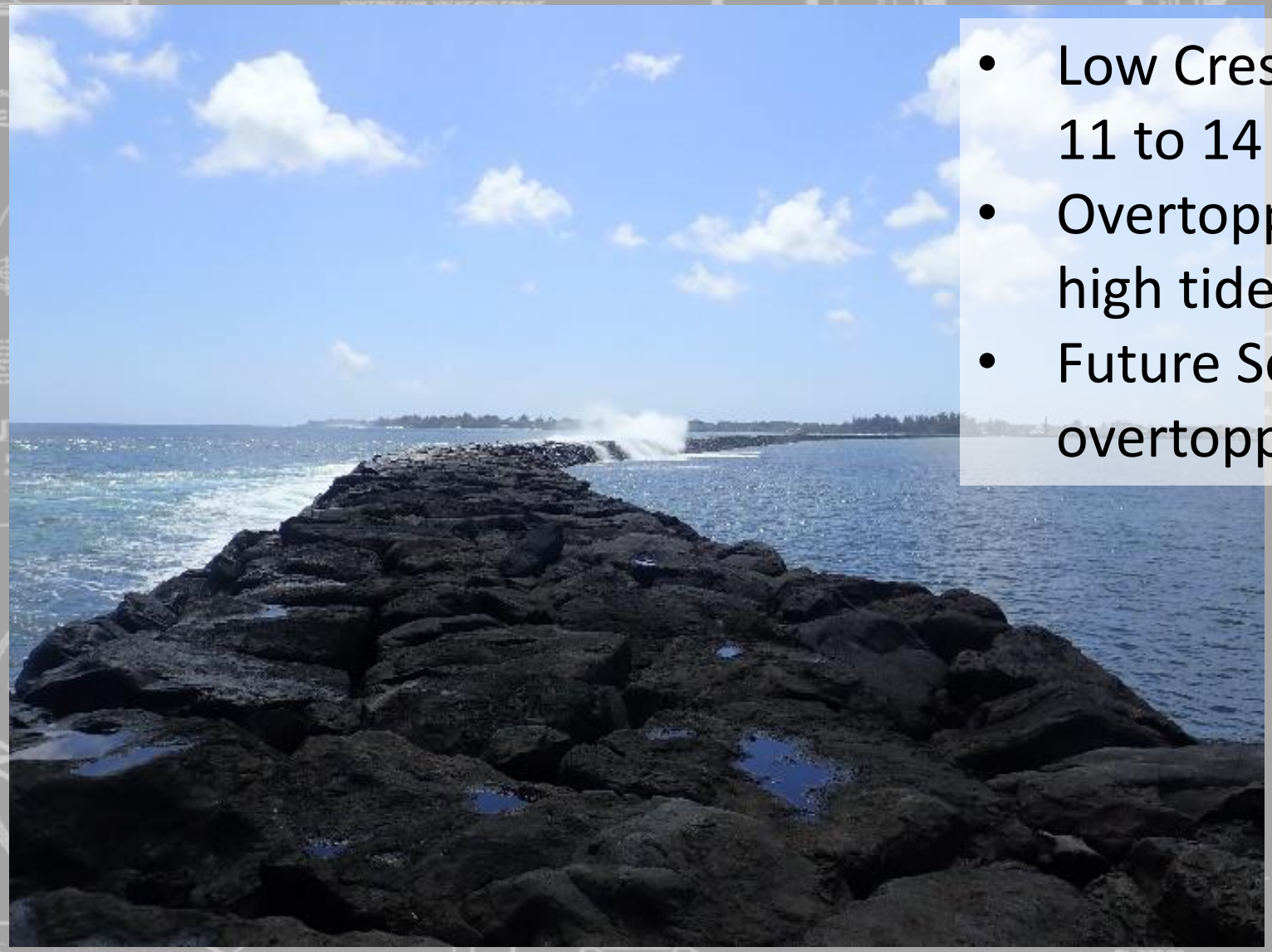
Hilo Harbor Breakwater, Island of Hawaii



- Low Crest Elevation of Breakwater : 11 to 14 feet (3.3-4.3m) above water
- Overtopping is already an issue at high tide
- Future Sea Level Rise will increase overtopping and impact navigation

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Ongoing Design Questions:

- With Sea Level Rise and larger wave heights, what size armor (rock or concrete armor unit) will be stable? => **STABILITY**

- What crest elevation will reduce overtopping to an acceptable level as sea levels rise => **PERFORMANCE**

- Can we complete a less robust repair now, but make it adaptable so as sea levels rise we can add more resilience in the future? => **ADAPTATION**

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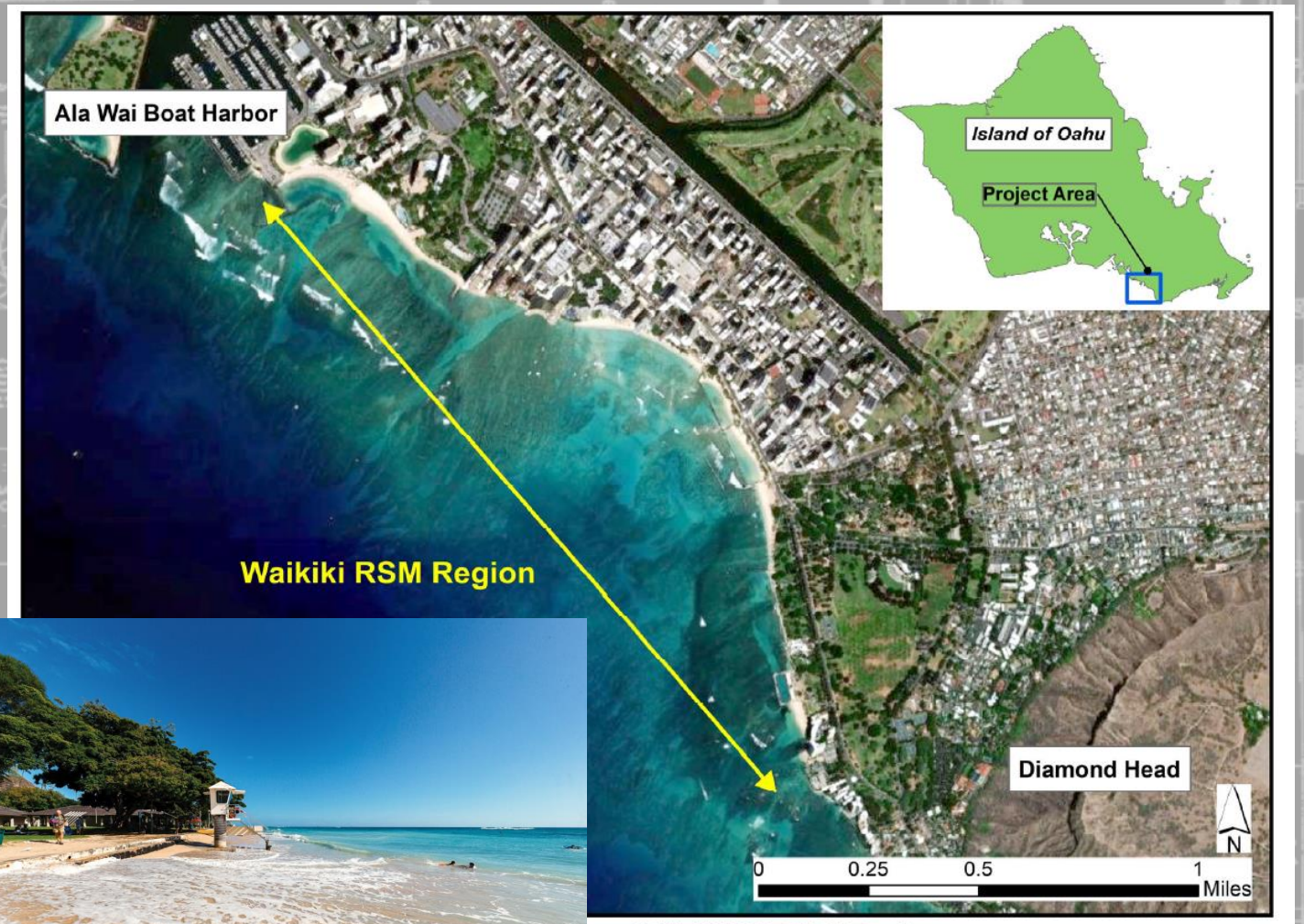
Waikiki Beach – Regional Sediment Management for Climate Change



n of Waikiki RSM Region

- How much sand is required to preserve and maintain Waikiki Beach under expected future Sea Level Rise?
- What are tipping points/thresholds where adaptation measures will be required for continued use of Waikiki?
- What measures may be viable and can we start preparing now?

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Honolulu Harbor – Modernizing an Aging Port for Future Needs

- Kickoff of Navigation Modifications Feasibility Study – Charette Held September 13-15, 2022
- Non-Federal Sponsor is Hawaii DOT Harbors Division
- All harbor modification alternatives within USACE authority will be evaluated for future SLR

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SUMMARY

- Coastal protection structures built in the past may not be stable or perform adequately under future sea level rise
- Existing beaches that provide coastal storm damage reduction and recreation along urbanized shorelines are susceptible to “drowning” under future sea levels
- Major ports providing commerce must evaluate landside infrastructure and its vulnerability to climate changes

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BACKUP

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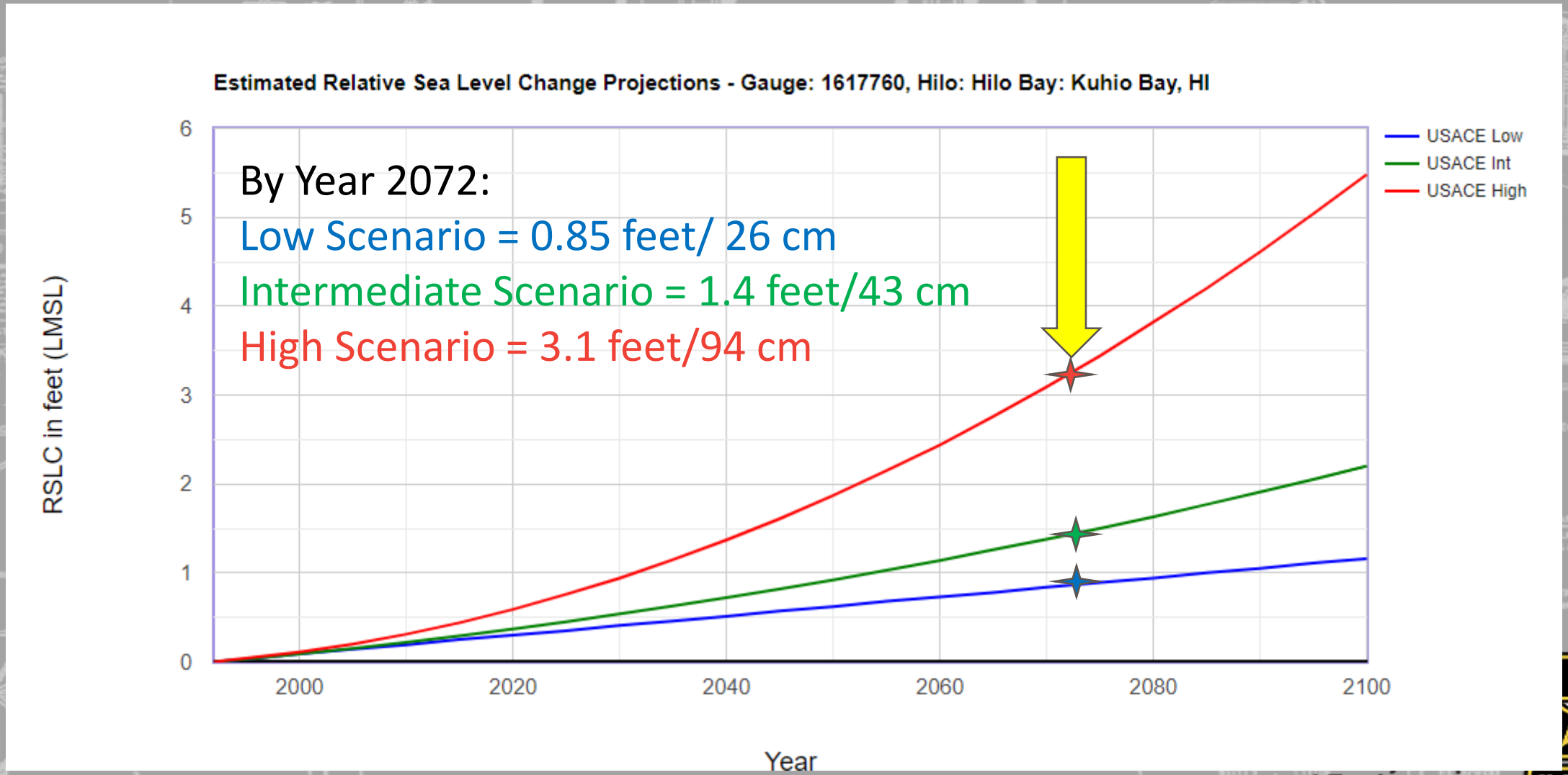
Estimated Sea Level Rise in Hilo, Hawaii by 2072



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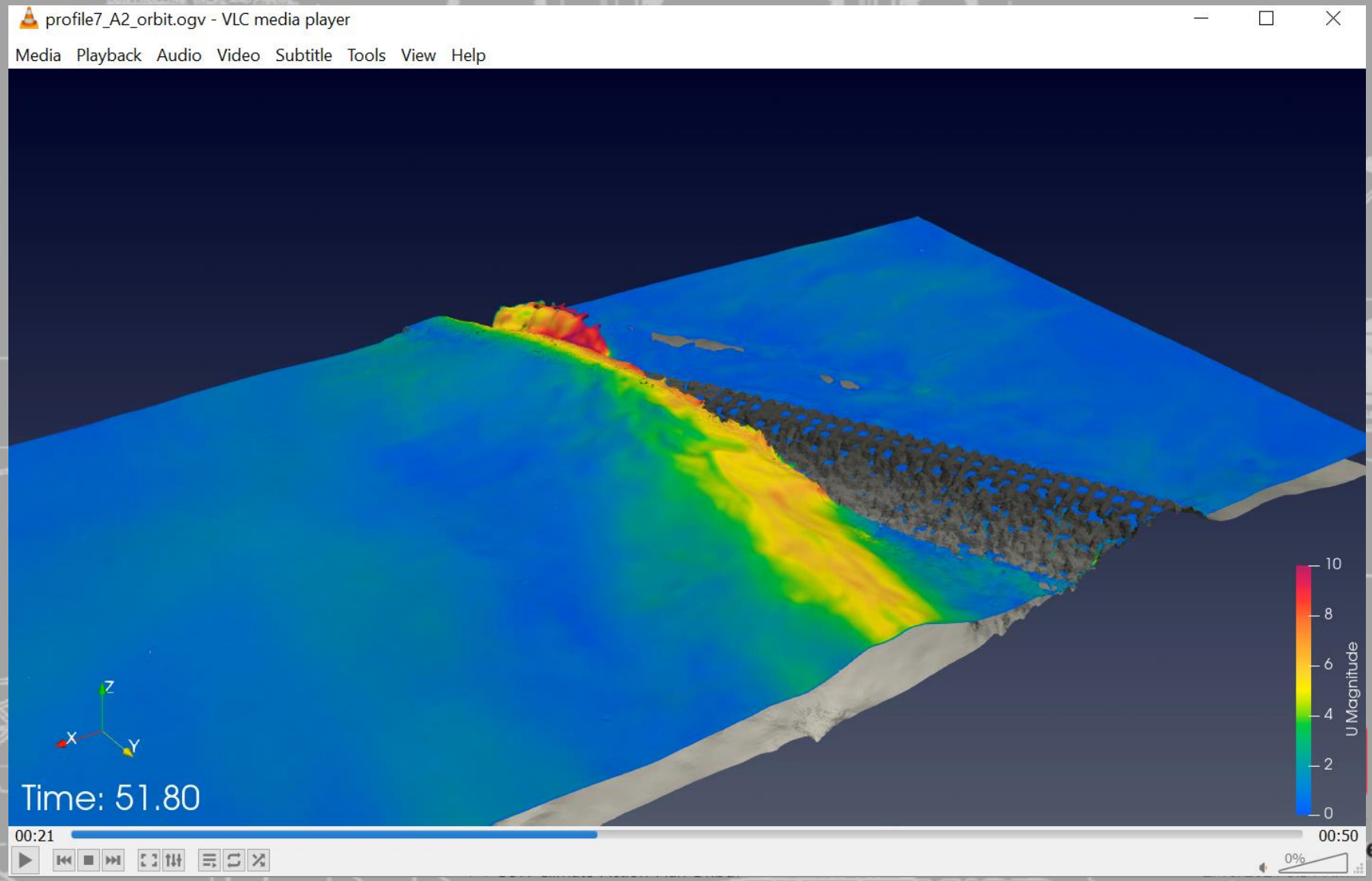
Wave Modeling to Evaluate Overtopping – Now and with Sea Level Rise (play video)



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