

Forecasting beach loss from sea-level rise on the island of Kauai

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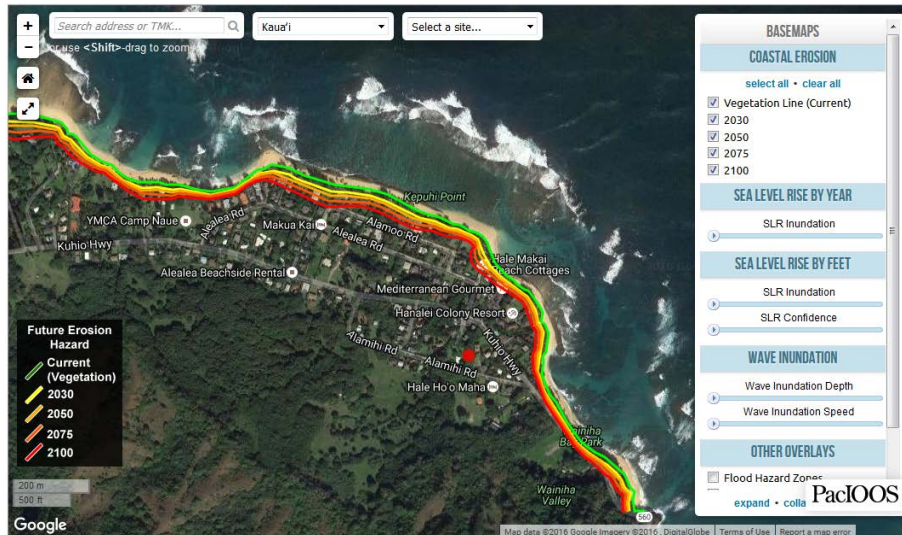


Sandbags protecting buildings on an eroding shoreline. Image courtesy C. Fletcher

Beaches on the Hawaiian island of Kaua'i attract visitors from all over the world, and many shoreline areas have a history of human settlement stretching back hundreds of years. However, despite their timeless appeal, beaches are in many ways temporary. The sand is in a constant state of flux due to changing ocean currents and waves. Although healthy beaches often lose sand in the winter and gain it in the summer, most beaches on Kaua'i are experiencing chronic erosion. This means that beaches are losing material over years to decades, and the shoreline is retreating inland. When beaches are pinched between shoreline development and rising sea level the erosion may destroy the beach entirely. The loss of a functional beach ecosystem can then leave shoreside structures at a higher risk of damage or loss due to inundation, further erosion or storms. The loss of sandy beach habitat also has environmental and cultural impacts. On Kaua'i approximately 73% of sandy shorelines are currently in retreat.

Researchers project that both the extent and intensity of beach erosion will increase significantly in the future. The estimated amount of net shoreline recession may nearly double by 2050, compared with historical rates. By 2100 over 90% of the beaches on Kaua'i may be eroding or have disappeared, and erosion in some regions could be 3 or 4 times the historical rate.

Our modelling combines historical shoreline data with predictions of sea level rise to estimate future erosion hazards based on average shoreline heights. Our hope is that this model can be extended to other areas with historical beach data. We have also produced a series of interactive online maps that allow management agencies and the general public to see which areas are at greatest probability of erosion. Both the results and derived maps will be used as part of coastal vulnerability assessments in climate adaptation plans for the State.



PacIOOS Voyager online map showing future erosion hazard projections. Image courtesy C. Fletcher.

Quick Summary:

- The beaches of Kaua'i and other Hawaiian Islands are highly important from cultural, ecological, and economic standpoints, but many are experiencing chronic erosion due to sea level rise.
- Modelling based on historical beach data and projected sea level rise suggests that almost all erodible beach areas on Kaua'i will begin to erode, and the rate of beach loss will increase significantly by 2050.
- Our model is easily extensible to other areas, and the information can be used as part of coastal hazard assessments and large-scale adaptive planning in order to try to maintain some beach habitats as well as prevent property and infrastructure damage. This work on the island of Kaua'i has been added to the statewide study of shoreline sea level rise vulnerability led by the Hawai'i State Intergovernmental Climate Adaptation Committee.



This project is a collaboration with the University of Hawai'i and Hawai'i Intergovernmental Climate Adaptation Committee (Cooperative Agreement #G12AC20500 from the US Geological Survey). Contact Chip Fletcher (fletcher@soest.hawaii.edu) for more information on this project. To learn more about climate science at PICSC, contact David Helweg at dhelweg@usgs.gov or visit: <https://nccwsc.usgs.gov/pacificislandspsc>.



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