

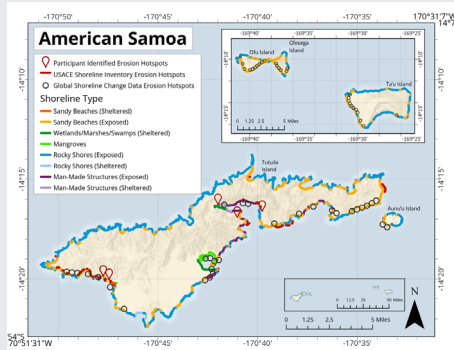
National Shoreline Management Study PACIFIC REGION



The islands that constitute the U.S. Pacific territories of American Samoa, Guam, and the Commonwealth of the Northern Mariana Islands (CNMI) are characterized by diverse coastal features including fringing coral reefs, mangroves, volcanic shorelines, sandy beaches, and steep cliffs. Shorelines in the U.S. Pacific are integral to ecosystems, local economies, and the cultural heritage of indigenous communities, but are increasingly experiencing ecological disruption and human-induced changes.

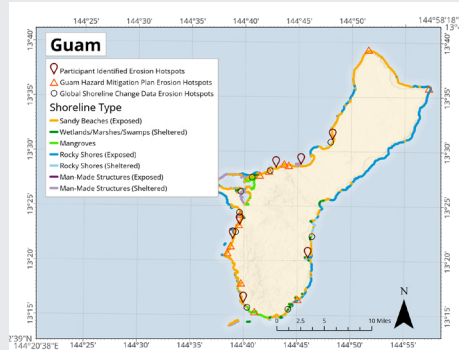


CRITICAL EROSION AREAS



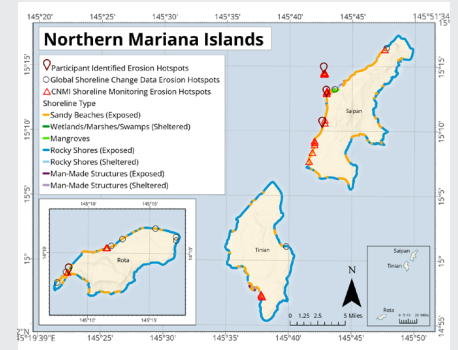
(Luijenkijik et al. 2018)

American Samoa: Shorelines are influenced by waves generated by local trade winds, distant swells, and tropical cyclones. High rates of erosion occur along Tutuila's southwestern coastline and in villages like Aua and Utulei.



(Luijenkijik et al. 2018)

Guam: Moderate rates of erosion and accretion are present around the island. The highest erosion rates are present on the western coastline including Tumon Bay and Nimitz Beach Park.



(Luijenkijik et al. 2018)

CNMI: The sandy shorelines of Micro Beach, Saipan Lagoon, and Mañagaha Island in Saipan are particularly vulnerable to shoreline retreat. Erosion hotspots along Rota include the Songsong sandy shoreline.



SHORELINE CHANGE DRIVERS

Multiple factors impact long-term shifts in erosion and accretion beyond the cyclical patterns of shoreline loss and recovery. Among other factors, these include storms, earthquakes, tsunamis, and sea level change.

Typhoon and Cyclone Impacts: The Pacific Islands frequently experience severe typhoons, with Guam, CNMI, and American Samoa regularly impacted by tropical storms and cyclones. These events cause extensive coastal erosion, sediment redistribution, and infrastructure damage. Notable storms, such as Super Typhoon Yutu (2018) in Guam and CNMI and Cyclone Olaf (2005) in American Samoa, have caused *hundreds of millions of dollars in damages, displacing communities and significantly altering shorelines*. Increasing storm intensity and rising sea levels amplify these impacts.

Sea Level Change:

American Samoa: Post seismic subsidence from a 2009 earthquake accelerated measured sea level change, with new projections of up to **1.5 to 3.9 feet (0.5 to 1.2 meters) of sea level rise by 2100**, increasing flooding risks in low-lying areas.

Guam and CNMI: Sea level change projections range from **1.0 to 3.4 feet (0.3 to 1.0 meters) of sea level rise by 2100**, threatening beaches, lagoons, and critical infrastructure.

Earthquakes and Tsunamis: Earthquakes and tsunamis have had dramatic impacts on the coastal shorelines of the Pacific Islands. The **2009 earthquake near American Samoa led to a tsunami with wave heights reaching 20 feet (6 meters) in Pago Pago, resulting in substantial land subsidence and accelerated local sea level rise. A 1993 earthquake and tsunami affected Guam and CNMI with waves up to 7.9 feet (2.4 meters).**



IMPORTANCE OF
PACIFIC SHORELINES

Ecological

- **Coral Reefs:** Nearshore coral reefs are vital for shoreline resiliency, reducing wave energy and protecting coastlines from storm surges and flooding.
- **Mangroves** provide critical storm buffering, sediment stabilization, and habitat for marine ecological communities.

Economic

- **Coastal tourism** is a cornerstone of the economy in Guam and CNMI, with a resulting economic value in the billions of dollars.
- **Coral reefs and mangroves** support fisheries critical for subsistence and small-scale commerce, particularly in American Samoa, where nearshore fisheries sustain many rural communities

Cultural

- **Indigenous Heritage:** Shorelines are home to sacred sites, archeological deposits, traditional fishing areas, and burial grounds central to the cultural identity of Pacific Island communities. Coastal shoreline changes threaten these resources.



Coral colony at Ta'ū Island in American Samoa
Source: <https://americansamoa.noaa.gov/gallery/>



KEY CHALLENGES
AND ADDITIONAL
CONSIDERATIONS

- **Challenge:** The frequent occurrence of typhoons, earthquakes, and tsunamis significantly influences erosion and accretion patterns, rapidly altering coastal landscapes and often intensifying the natural processes.
 - **Additional Consideration:** Sea level change and coral reef degradation may lead to increased wave heights and coastal erosion throughout the Pacific Islands. This could pose risk to existing infrastructure, environmental resources, and restoration efforts.
- **Challenge:** There is no consistent, comprehensive long-term data collection and analysis program to inform predictions of future shoreline change.
 - **Additional Consideration:** Throughout American Samoa, seawalls and other traditional armoring methods have been used to mitigate flood risk to coastal infrastructure. Although effective in reducing flood risk, these approaches have accelerated erosion. Historically in Guam, a blend of engineering measures have been used (hard structures, natural features, nonstructural solutions) to stabilize its shorelines. CNMI regulations mandate a comprehensive evaluation of Nature-Based Solutions in conjunction with traditional hard structures for any proposed shoreline stabilization measure.



REGIONAL RECOMMENDATIONS

Shoreline Monitoring: Collect or develop updated local shoreline change rate data and sediment transport data. Establish regional data repositories and data sharing programs.

Shoreline Management: Provide training to improve the quality of permit applications and processing of shoreline management projects for more adaptable, sustainable, and resilient shores. Utilize Nature-Based Solutions to maximize benefits of shoreline management projects.

Social and Cultural Considerations: Incorporate Indigenous Traditional Ecological Knowledge (ITEK) and Indigenous Voices into shoreline management projects.

Environmental Considerations: Establish conservation plans and best management practices for preserving coastal ecosystems and community resilience.



Fagetele Bay monitoring buoy, American Samoa
Source: <https://www.coris.noaa.gov/monitoring/climate.html>