Maui County: Three strategies for sea level rise adaptation

"The whole premise of the Coastal Zone Management Act (CZMA)," said Jim Buika, Coastal Resource Planner at the Maui County Planning Department, "is to ensure during a rush to develop the shoreline that our sensitive coastal ecosystems are protected. So our CZMA is a very powerful tool, especially out here in Hawai'i for preserving our coastal ecosystem as much as possible." Each county implements the CZMA individually with county-specific ordinances and other coastal protection measures. In Maui County, the Planning Department is taking a three-pronged approach to addressing how sea level rise will impact its shoreline: restoring and protecting coastal dunes; updating erosion-based shoreline setbacks; and planning for post-disaster reconstruction.

DUNE PROTECTION AND RESTORATION PROGRAM

An example of dune grading and susequent coastal erosion.

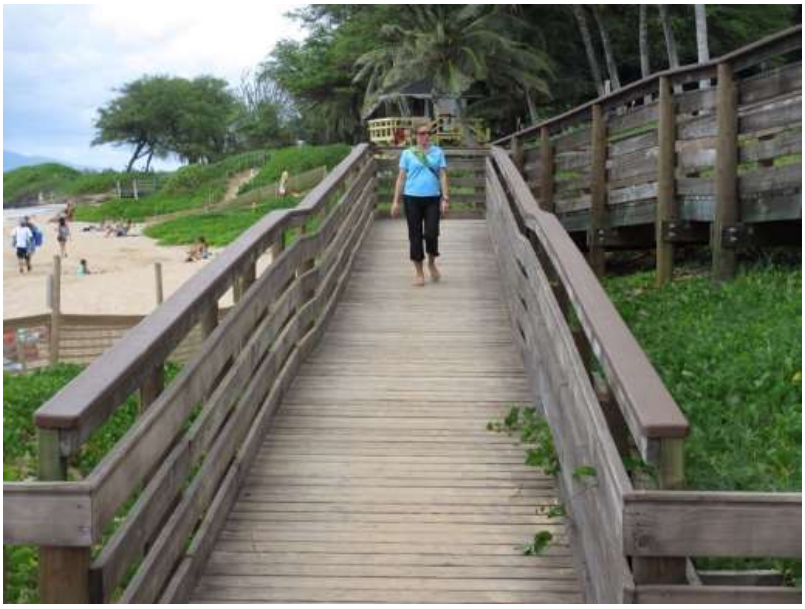
Maui County recognizes that coastal sand dunes are an important natural and cultural resource that has been ignored and subject to degradation. Coastal dunes offer a variety of services, which include providing a coastal barrier for protection of waterfront development and supplying beaches with sand during high wave events; filtering pollution from upland runoff; hosting habitat for many plant and animal species that are unique to Hawaii; and serving as important cultural heritage sites. As coastal development pressures mount and sea level rise forces accelerated erosion and shoreline retreat, coastal dunes will become both more threatened and more important for beach health and hazard mitigation. In concern for continued protection of Maui's critical and sensitive coastal dunes, the County employs two complimentary approaches. The first being a dune grading ordinance developed and passed in 2003, which prohibits grading of frontal (primary) coastal dunes. The second approach is a long-standing dune restoration program conducted in partnership with the University of Hawaii Sea Grant Program and trained volunteers. These programs were motivated by the historical trend of dune grading along shoreline properties.

"There were many instances in the past where dunes were flattened during property development in favor of other types of landscaping and direct access to the ocean," said Tara Owens, Coastal Hazards Specialist with University of Hawai'i Sea Grant partnering with Maui County Planning Department. In addition, sand mining has historically contributed to degradation of coastal dunes systems on Maui.

"The coastal sand dune is an important part of the coastal ecosystem," said Owens. "I often make the analogy of a beach sediment budget similar to your own checking and savings accounts." The active beach has a limited sand supply from which sand grains are constantly coming and going, just as your checking account has a

limited dollar supply from which daily deposits and withdrawals are made. In this analogy, the coastal dunes just inland of the active beach contain a reserve of sand to provide sand to the beach and protect inland development during seasonal high wave events and storms just as your personal savings account provides a buffer of additional dollars during extreme times.

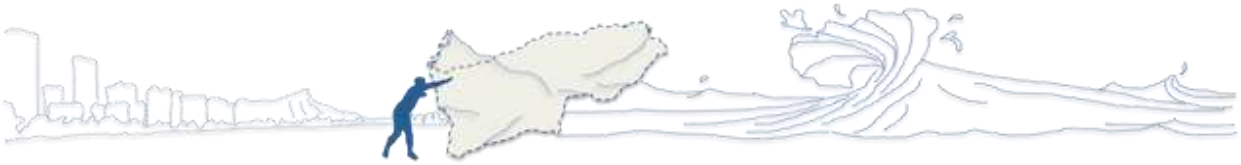
On beaches where dunes have been degraded or destroyed, a group of dedicated volunteers has partnered with Maui County to implement restoration projects. Particularly in wind-dominated coastal environments, restoration can be a fairly quick process. There are many tools of the trade, including sand wind fences and native plants that are particularly good at trapping and stabilizing sand to rebuild dunes. Providing designated footpaths or access pathways through or over the dunes is also an important part of any restoration strategy to prevent trampling of the plants which stabilize the system.



Above: A boardwalk created to protect dunes from erosion.

Left: Signage that accompanies a boardwalk created to protect dunes.

Above: Wind fences installed to gather and maintain sand on dunes. Below: A restored dune with native vegetation.



These restoration projects have been very successful in bringing sand and attention back to coastal dunes, though, as with any project, there have been a few challenges along the way. For instance, dune walkovers, which are widely regarded nationally as a best management practice are often sited within flood zones that may have conflicting criteria and require additional permits for coastal construction. In the end, solutions were identified and permits have been obtained for all of the recent dune walkovers projects on Maui while highlighting the ever-present need for interagency coordination to streamline any recommended adaptation strategies.

Key Message: Interagency coordination can streamline adaptation processes in arenas with multiple jurisdictions.

Many restoration projects implemented thus far have been located in South Maui but because of the successes of these projects, the program is expanding to restore more beaches in North and West Maui. In addition to the successes of physical restoration, the program has improved public awareness about the importance of dunes and how to take care of them. Prior to the dune restoration program, shoreline landowners used to build without regard for dune health. "Things were constructed on the coastline in a very ad-hoc manner without permits," said Jim Buika. "But now, people cannot really get away with anything because we have an educated group of watch dogs out there who know what we're doing." There are, however, some educational topics that still need attention. Owens and Buika stressed the need to educate realtors about regulations on waterfront construction because many new homeowners are given unrealistic ideas of what they can build on their coastal plots.

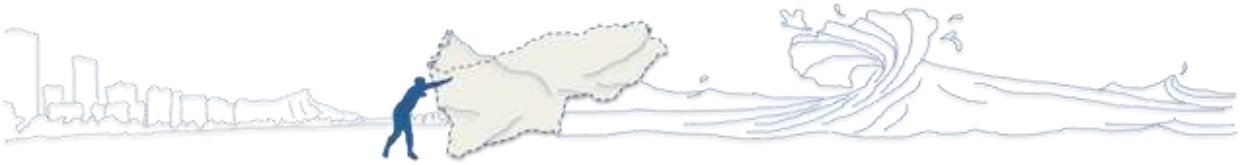
Key Message: Educating the public can go a long way in protecting coastal resources.

"Because of the County government and community awareness that was ultimately gained from the program, the County established the first grading ordinance in Hawai'i," said Owens. This ordinance prohibits building in or otherwise altering the landscape within a delineated dune area. The ordinance requires development projects on coastal plots to seek a dune delineation by Owens or other coastal expert to outline the dune area, in which grading cannot occur. To this day, Maui's dune grading ordinance is the only one in the state.

Though there are pressures on the coastline from landowners wanting to develop as close to the beach as possible, the dune ordinance is firm. "I think the protection of the dune is an absolute. It can't be graded," said Buika.

Erosion setback updates

In the same year that the dune ordinance was written into law, 2003, so too were new erosion-based shoreline setback rules approved. Twelve years later, with updated erosion rate maps provided by the University of Hawai'i School of Ocean and Earth Science and Technology (UH SOEST) Coastal geology Group, there has been an opportunity to review the setback policy. In the over ten years that has passed since the first generation of



erosion rate maps were, science has progressed to support a new statistical methodology for reporting the rate at which a beach is eroding. Applying this new methodology, the reported erosion rates on the second generation maps in some cases appear to have lowered, implying that erosion has slowed and associated shoreline setbacks would transition *makai* (seaward).

"In reality, in these scenarios it's not that the erosion has actually lessened" explained Owens, "it's just a statistical way that the data was presented."

"Adopting the maps as is could have produced a lot of damage by moving setbacks *makai* when the erosion hazard situation really is getting worse," said Jeff Dack, Land Use Planner at the Maui County Planning Department. Erosion is an ongoing threat to Maui's shorelines, even with the current setbacks, so decreasing the distance required between shoreline and structure makes Maui's infrastructure even more vulnerable. Accelerated sea level rise, not yet considered in the setback formula, will only increase this vulnerability. "We had to take a step back and ask, how do we deal with that?"

"It got us into taking a multi-hazard approach to our shoreline setbacks," said Dack. "In a proposed revision, you see, we are considering not just historic, chronic erosion but we're also considering episodic events; we're looking at what the useful life of structures are – and possibly going from a 50 year to maybe a 70 year for useful life and we're looking at incorporating a sea level rise component, using the Bruun Rule as a basic approach to it." The Bruun Rule is a simple geometric model that describes how the shoreline will move *mauka* as the water level rises.

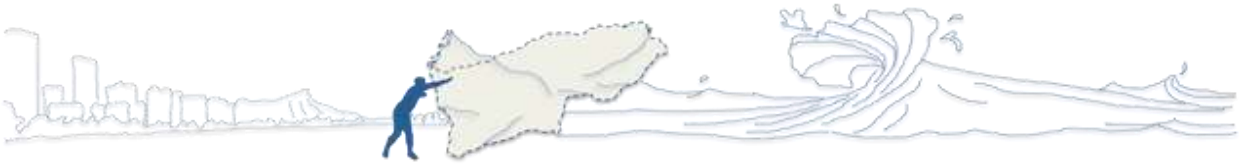
The new formula that the Planning Department plans to propose would increase the considered lifetime of a structure by which the erosion rate is multiplied, increase the minimum setback to account for episodic events, and add a buffer for accelerated sea level rise. This formula would increase the setbacks on most parcels compared to the existing setbacks.

The passing of the original erosion setback policy was a long process of 7 or 10 years with concerns from developers and coastal landowners. Eventually, landowners accepted that erosion setbacks are in the best interest of development and they have turned out to be non-controversial parts of coastal development since. "They were rarely ever challenged," said Buika. "Whatever we said the setback was, that was kind of written in stone."

The Planning Department is cognizant, though, that any proposed revisions of the setback formula and associated increases may cause renewed concern from developers and landowners. The county is not so concerned with pushback on the formula – they have vetted their formula with scientists and policy makers. They are more concerned with trying to explain the differences between first and second generation erosion maps, which will require everyone to wrap their head around statistics and formulas.

"It may be challenging to explain because we have to get into really technical issues about the data and the statistics behind what is presented as a simple erosion rate," said Owens.

If the new formula is adopted, the county's challenges will not be over yet. In the cases where the newly adopted setbacks are more restrictive than the previous setbacks, Buika said, "you end up with a lot of non-conforming properties where they may have been built legally but now they're in the setback."



Coordinating the retreat of those non-conforming structures away from the shoreline is a challenge many coastal communities are grappling with. "Shoreline retreat is a nice term in theory but, boy, trying to do it is just incredibly difficult to really effectively get it done."

Post-Disaster Reconstruction For sea Level Rise Adaptation

One way in which Maui County is addressing the problem of non-conforming structures on the coastline is through resilient reconstruction after damage in a disaster. The Maui County Planning Department recognized that in the rush to rebuild structures that were damaged in a storm or flood event, building codes and coastal management priorities are often disregarded in favor of quick recovery. In response to that, the Planning Department led a planning process to develop a set of guidelines and protocols to build back "safer, stronger and smarter" after a damaging coastal event. To develop these tools, the Planning Department held a series of workshops in communities across the county to understand priorities for each community in rebuilding. These workshops were intended to fulfill several objectives, (see right) including making communities more resilient to sea level rise.

RECONSTRUCTION GOALS & OBJECTIVES

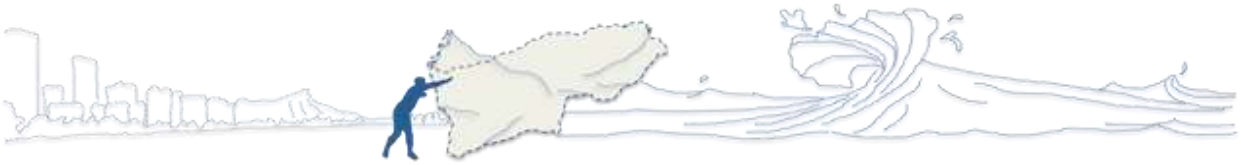
Engage community stakeholders to develop reconstruction guidelines and protocols that:

- Expedite the rebuilding process
- Triage actions to address immediate and long-term needs
- Protect sensitive environmental and cultural resources
- Respond in a planned manner without arbitrary or capricious decisions
- Incorporate mitigation and adaptation strategies to become a more resilient community

The Planning Department held 5 community meetings – 4 on Maui and 1 on Molokai – with a total of 108 stakeholders representing various sectors including homeowners, architects, construction workers, emergency personnel and many more. In the 3.5-hour-long workshops, the Planning Department asked the participants to put themselves in the shoes of a planner or other decision maker in determining the adequate level of review and appropriate rebuild strategies for hypothetical damages incurred on structures on different shoreline types. For example, if a waterfront house on a sandy beach is inundated by a seasonal high wave event that caused structural damage, should it be rebuilt immediately using best management practices, inspected first, or sent through the thorough regular permitting process? Participants found these decisions difficult to work through but ultimately produced a set of protocols to follow in post-disaster construction. "A lot of times, at the end of meetings, we heard back 'Wow, now we realize how difficult it is to make these kinds of decisions. Your job is actually really hard,'" said Owens.

Participant responses illustrate several common threads between the communities, including the need for pre-deputized inspectors, increased public education, and other tools for recovery. The workshops also showed some distinct differences in priorities between communities. For example, Molokai participants emphasized a need to prioritize home reconstruction so that fewer residents will have reason to move off-island while all

Key Message: Engaging the community will ensure that actions align with local values and improves community buy-in.



accessory structures such as swimming pools should be delayed. Whereas in South Maui, swimming pool repairs were identified as a higher priority because of the role they play in tourism and thus economic recovery. “We made it a goal to be community specific and we heard very, very different feedback from our communities,” said Owens.

The Planning Department compiled these protocols into a set of messages which they can release post-disaster as public service announcements to guide landowners in what steps they need to take to recover from the damage incurred. This public guidance aims to minimize potentially harmful short-term solutions such as constructing a cement wall to protect beachfront property and instead encourages long-term hazard mitigation and sea level rise adaption strategies. “So we don’t want to necessarily build back in the same site in the exact same way because we want to increase our resilience in our communities,” said Owens. Some strategies the Planning Department has identified for rebuilding to mitigate hazards to coastal structures are retrofitting structural components, rebuilding to code, armoring (when appropriate), and elevating structures. Strategies to adapt to sea level rise include reconfiguring arrangement of structures on a plot, relocating structures or retreating, restoring beach ecosystems such as dunes, and demolishing or retiring structures where necessary.

In some cases the rebuilding strategies that promote resilience and environmental sensitivity can be overlooked or even undermined as a result of Disaster Declarations or Emergency Proclamations. These declarations aim to fast-track reconstruction by suspending many regulations such as building codes, historic preservation, Conservation District Use Permits, and SMA and shoreline permits. Though these declarations help those with damaged homes get back on their feet, without considering mitigation and adaptation measures there is nothing to ensure that these same structures aren’t repetitively damaged in the next event. One of many identified unmet needs and next steps from the project involves collaborating with other State and County agencies and the Governor’s office to identify strategies that could still streamline reconstruction while not compromising sea-level rise adaptation, such as an overlay ordinance that could apply only in post-disaster conditions.

Summary

Maui County Planning Department’s three approaches help to maintain natural resources and manage new and existing development in the face of rising sea levels and other coastal hazards. “The dunes being a way to keep our beaches healthy as long as we can,” said Owens, “and then our setbacks being a way to create a buffer for new development, and then the disaster project being a way to deal with the existing development that’s going to be impacted by episodic events.” Using such tools along with community engagement and education and outreach, the Planning Department has seen success in protecting their coastlines thus far and will continue to improve adaptation through their erosion setback revisions and post-disaster reconstruction.

Written by Ali Andrews, Tetra Tech; based on an interview on October 22, 2015 with Tara Owens, Coastal Hazards Specialist with University of Hawai’i Sea Grant partnering with Maui County Planning Department; Jim Buika, Coastal Resource Planner at the Maui County Planning Department; and Jeff Dack, Land Use Planner at the Maui County Planning Department.