



On the Front Line of Sea Level Rise:

Adaptation at the Office of Conservation and Coastal Lands Begins with Improved Resilience to the Hazards Our Coastal Communities and Shoreline Environments Are Facing Now

“At the Coastal Lands Program within the Department of Land and Natural Resources (DLNR) Office of Conservation and Coastal Lands (OCCL), we really end up being the boots on the ground when it comes to addressing the impacts of coastal erosion,” said Dr. Brad Romine, with the University of Hawai‘i Sea Grant College Program (Hawai‘i Sea Grant) and Coastal Lands Program Coordinator at OCCL. The OCCL regulates Conservation Lands in Hawai‘i, which includes coastal and submerged lands defined from the certified shoreline boundary *makai* (seaward) to the three-mile limit of State waters. “When there’s a major erosion problem, when someone’s home is at risk of falling into the ocean – like at Sunset Beach – we’re the ones who get called out there. We’re dealing directly with the landowners discussing the challenges and options they have for dealing with a shoreline erosion problem. So it’s in our face, we’re dealing with it on a day-to-day basis, and I think that’s why our office really feels a sense of urgency to deal with the problems associated with sea level rise proactively.”

“The science is saying that these erosion and coastal flooding problems are only going to become more frequent and more severe with increasing sea level rise; and, frankly, we [the State] are already overwhelmed trying to manage and mitigate these problems,” further explained Dr. Romine. This escalation of coastal hazards by sea level rise will need to be met with escalated and innovative approaches to adaptation.



Coastal Erosion on the North Shore of O‘ahu. Photo Credit: Dolan Eversole, Hawaii Sea Grant

Key Message: Hawaii’s existing coastal erosion problem is only going to get worse with sea level rise. Improving coastal community resilience and natural resource conservation makes sense for now and the future.

The actions that need to be taken to adapt to sea level rise are the same actions that should be taken now to adapt to the hazards that Hawai‘i’s coastlines are currently facing. These strategies include: preserving and restoring natural beach environments, siting new development and



infrastructure outside of coastal hazard zones, and moving existing at-risk development back from the coast. These adaptation measures and improved resilience, which are often referred to as “no regrets” strategies, make sense for now and for the future with rising sea level.

“The world has suffered record-shattering temperature increases over the past several year,” said OCCL Administrator Sam Lemmo. “While some of this may be attributed to the powerful 2015-16 El Nino event, there is no doubt in my mind that human actions are fueling global warming. Each day that passes without us taking bold actions to curtail CO₂ emissions and prepare for unprecedented planetary changes, is another day that we steal from future generations. Moving forward, we should endeavor to: 1) recognize that change comes from each and every one of us; 2) support efforts to curtail the burning of fossil fuels, and 3) recognize the limits of the earth and adapt our behavior accordingly.”

In some cases, the tools we have used in the past to recognize and adapt to earth’s changes, such as coastal erosion, can be beneficial in adapting to future sea level rise. “We’ve been adapting to coastal hazards since day one – since the first settlements along the coast here. For example, Native Hawaiians adapted by building fishponds and they adapted their lifestyles based on where sea levels were and how tides rose and fell. They avoided settling in areas that were vulnerable to flooding,” said Andy Bohlander, Shoreline Specialist at OCCL. The Counties and the State have existing tools to reduce erosion hazards for new development including certified shorelines, which function similarly to a rolling conservation easement, and erosion rate-based shoreline setbacks, which provide a protective buffer.

In many cases, however, the tools of the past will be inadequate to address the impacts of sea level rise at the rate at which they are expected to occur. In the context of coastal erosion, sea level rise will increase the rate of erosion significantly. A recent University of Hawai’i (UH) study found that erosion rates could potentially double by mid-century. Existing development is the often-ignored ‘800-pound gorilla’ in the room when it comes to sea level rise adaptation which is not adequately addressed in existing regulations. Unfortunately, much of the development along Hawai’i’s shorelines was permitted during an era when government and developers were largely ignorant of coastal processes, let alone shoreline recession. Some development today continues this pattern. For example, many residential homes were constructed too close to the shoreline because they were permitted prior to the adoption of Hawai’i’s shoreline setback rules. This led to the proliferation of shoreline armoring in the mid-20th century. The question now is, how can the state adapt existing communities and development to make them more resilient while preserving beaches and coastal environments for future generations? These two important goals are not only achievable but could be mutually supportive of one another. In order to be successful, adaptation will require the courage to act in the face of uncertainty and the

Key Message: A major shift is needed in the way Hawai’i’s shorelines are developed in order to preserve beaches and ensure the safety of coastal communities for future generations.

commitment to make the necessary strategic investments. Ultimately, this may require a paradigm shift in how the state and counties think about development and resiliency along the coasts.



“At the agency level, one of the big problems we are facing is that we’re reactive rather than proactive due to staff and funding limitations and the way the regulatory system is set up,” said Romine. “We know there’s erosion happening on these beaches but nothing happens on the landowner’s or the agency’s end until it gets to the point that a house or critical infrastructure is threatened and we’re faced with an emergency situation. We need to be more proactive and deal with it on a regional basis, which is a major motivating factor for developing the State Sea Level Rise Vulnerability and Adaptation Report and the climate adaptation plans to follow.”

Through more funding and better planning, OCCL could implement proactive strategies on a regional basis rather than a parcel-by-parcel approach. One of these strategies, Romine and Bohlander explained, could be littoral cell-based management. Littoral cells are isolated sections of beach that have unique sediment transport dynamics that vary from adjacent sections of the coastline. Geologically, it makes sense to protect beaches on a littoral scale but it can be difficult to implement larger scale projects due to lack of consensus among landowners and the additional research required to define and understand littoral cell dynamics across the state. However, a littoral cell-based approach was successfully adopted by the Waikiki Business Improvement District to implement strategies to protect and nourish the 7 littoral cells of Waikiki, each of which has unique physical characteristics and processes that require different management strategies. This approach to beach management in Waikiki could serve as an example to facilitate other littoral scale management projects across the state.

Another strategy that could proactively address the impacts of sea level rise is a coastal land acquisition program that would enable the state or counties to purchase particularly vulnerable waterfront properties from landowners. “We’re always talking about that – how to get people out of these really hazardous properties where shore protection – typically in the form of seawalls and rock revetments – could potentially result in total loss of the adjacent beach or dune,” said Romine. This strategy is contentious for a number of reasons but could ultimately be the best answer in locations where the beach resources are particularly important to the State and are a focus of preservation efforts.

Littoral cells and coastal land acquisition programs are just two examples of adaptation strategies and there are many more, each with their own pros and cons. With over 750 miles of coastline to plan for, it’s critical that the state develops a balanced portfolio of options and a system to implement them.

The OCCL would also like to see the state explore new alternatives for what adaptation to sea level rise could look like in areas that may require more innovative design solutions. For instance, a group of UH Architecture students led by Professor Judith Stilgenbauer recently envisioned how the area surrounding Ala Moana Beach Park could be redesigned to adapt to sea level rise while still preserving its character and value as a public recreational space and economic center. Exploring how problems might be solved and visualizing potential solutions, explained Bohlander, inspires us to overcome the most overwhelming challenges. Though the impacts our coasts will face as sea level rises will require substantial effort and commitment, Bohlander and Romine are optimistic. The OCCL and their partner State and county agencies, through their work with the Interagency Climate Adaptation Committee (ICAC), are in a good position to facilitate the development of policies and programs that can improve resiliency of development and protect natural resources.



“The history of the development of our erosion policies is a really good analog for the future of our sea level rise policy development,” said Bohlander. Thirty years ago, people recognized that coastal erosion was a statewide problem but we didn’t understand the extent of the problem until scientists, such as Dr. Chip Fletcher and others at UH, were able to quantify the historical trends and map erosion “hot spots” along the shoreline. These data led to the development of erosion rate-based shoreline setbacks at Kaua’i and Maui Counties and the DLNR, which are some of the strongest in the nation. Now, the state is in a similar ‘discovery phase’ with sea level rise and better data is needed to understand the problems and develop solutions. “Once you have the data, and you can start downscaling it to the level that planners and decision makers can use, new policies will naturally evolve from there.”

Key Message: Solid scientific understanding enables decisive action.

As SLR science has evolved, so has OCCL’s approach to addressing coastal hazards. “I think one of the big changes has been the emergence of the term *sea level rise* in the lexicon of coastal managers and planners,” said Bohlander. “It wasn’t until sea level rise became a commonly used term, a household name in the science, engineering, and planning communities, that we really started thinking about it as a priority issue.” As science evolves, the state becomes better equipped to develop solutions.

A good example of this progression is illustrated in the difference between the OCCL’s Coastal Erosion Management Plan (COEMAP), published in 1998, and the Kailua Beach and Dune Management Plan, published in 2010. In the hefty, 90-page COEMAP, comprehensive plans are laid out to address coastal erosion in the state. Sea level rise is noted as a contributing factor to beach erosion but isn’t addressed fully until an appendix in which a projection of 50 cm of rise by 2100 is cited – about half the magnitude of current projections – whereas in the Kailua Beach and Dune Management Plan, anticipating the impacts of sea level rise is the first recommendation on the first page of the document.

“You can see the transformation of the department through these two examples, and the evolving thinking leading up to the present sea level rise report we’re working on,” said Romine. The OCCL hopes that the Sea Level Rise Vulnerability Assessment and Adaptation Report produced by the ICAC will provide the necessary scientific basis to develop and implement the policies and programs needed to reduce the impacts of sea level rise. It is critical that the state learns from the past to develop innovative solutions to address the complex problems facing Hawai’i’s coasts.

“I find some degree of hope,” said Lemmo, “if we can collectively embrace three basic concepts: 1) accept the fact that the planet cannot support unlimited growth, 2) implement an aggressive carbon mitigation campaign, and 3) learn how to accommodate rapid planetary changes such as sea level rise. The ICAC and the Sea Level Rise Vulnerability and Adaptation team are endeavoring to design a framework, or blueprint for sea level rise adaptation that we hope will provide the impetus for actions necessary to mitigate catastrophic social and economic effects resulting from rising seas.”

Written by Ali Andrews, Tetra Tech; based on an interview with Andy Bohlander, Shoreline Specialist at OCCL, and Brad Romine, with the University of Hawai’i Sea Grant and Coastal Lands Program Coordinator at OCCL, November 19, 2015; and Sam Lemmo, OCCL Administrator, June 12, 2016.