

HISTORY OF COASTAL ZONE MANAGEMENT IN HAWAII
AND REVIEW AND ANALYSIS OF OPTIONS FOR MANAGED RETREAT
IN RESPONSE TO SEA-LEVEL RISE

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By
KOREY L. WONG

Thesis Advisor

CHARLES FLETCHER

I certify that I have read this thesis and that, in my opinion, it is satisfactory in scope and quality as a thesis for the degree of Bachelor of Science in Global Environmental Science.

THESIS ADVISOR

Charles Fletcher
Department of Earth Sciences

For Lisa Wong, Alia Wong, and Warren Wong for their continued support
throughout my journey .

ABSTRACT

A recent study at the University of Hawai'i (Tavares et al. , 2020) modeled the impacts of future SLR on hardened shorelines and found that by mid-century a potential 40% of O'ahu beaches could be lost. With the current state of coastal development, a 3.2 foot rise in sea level would leave 6,500 homes damaged or destroyed and displace 20,000 residents statewide (Hawai'i State OP, 2019) by 2100. Summers et al. (2018) suggest that current state and local coastal zone management policy has led to continued erosion and beach loss on the island of O'ahu. While recent amendments to the state CZM statutes (HRS § 205a) ban private shore protection structures, there is still more work to be done in the area of legacy sea walls and existing structures. Managed retreat, the purposeful and coordinated movement of development and people away from the shoreline, offers a solution to both protect public trust lands (beaches) and minimize the habitation of these hazardous areas. This paper will review the history, significant legal decisions, and present-day dilemmas that characterize the federal, state, and county coastal management regime in Hawai'i. After analyzing these factors, the paper will examine pathways for a managed retreat from the shoreline.

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1.0 INTRODUCTION

Global mean sea-level rise (SLR) has been accelerating since at least the 1960's (Dangendorf et al. 2019). Since satellite monitoring of the ocean surface started in January 1993, global mean SLR has averaged 3.42 mm/yr, and in the past decade has averaged 4.53 mm/yr (Aviso Satellite Altimetry Data, Accessed on Oct. 31 2020). The rate of global mean SLR is now more than 3 times faster than the 20th century average, threatening coastal communities and ecosystems worldwide (Chen et al. 2017).

Projections of future global mean SLR are the subject of continued research. The Intergovernmental Panel on Climate Change Special Report on the Ocean and Cryosphere projects that global mean SLR in 2100 is likely (above 66% probability) to range between 0.29-0.59 m under a low greenhouse gas (GHG) emissions scenario with respect to 1986-2005 (RCP 2.6) (Oppenheimer et al., 2019). Under a high GHG emissions scenario (RCP 8.5), global mean SLR is projected to reach between 0.61-1.10 m in 2100 relative to mean sea level 1986-2005. There is significant uncertainty in the high end of global mean SLR projections related to the stability of ice sheets, especially the Antarctic Ice Sheet. Model studies indicate that the possibility of multi-meter SLR grows with increasing emissions (Hock et al., 2019).

The Fourth National Climate Assessment, Volume 1 Climate Science Special Report, finds that global mean SLR is very likely (above 90% probability) to rise 9-18 cm by 2030, 15-38 cm by 2050, and 30-130 cm by 2100 (Sweet et al., 2017). There is very high confidence in the lower bounds of these estimates, medium confidence in the upper bounds for 2030 and 2050, and low confidence in the upper bounds for 2100. Emerging science regarding Antarctic

Ice Sheet stability suggests that, for high emission scenarios, a global mean SLR exceeding 2.4 m by 2100 is physically possible, although the probability of such an extreme outcome cannot currently be assessed (Sweet et al., 2017).

The Antarctic remains the largest source of uncertainty in planning for future SLR. Because the development of innovative policies and programs designed to build resiliency to SLR require long lead times, coastal communities cannot wait for Antarctic science to clear up. For this reason, Bamber et al. (2019) published a structured survey of expert scientific opinion concluding that thermal expansion of ocean water, combined with mass loss from mountain glaciers and the Greenland and Antarctic ice sheets, results in a global total SLR estimate that exceeds 2 m at the 95th percentile. They state that their results support the use of scenarios of 21st-century global total SLR exceeding 2 m for planning purposes. Additionally, they conclude that the 95th percentile ice sheet contribution by 2200, for the +5 °C scenario, is 7.5 m. Study author Jon Bamber stated, "Such a rise in global sea level could result in land loss of 1.79 million km², including critical regions of food production, and potential displacement of up to 187 million people. A SLR of this magnitude would clearly have profound consequences for humanity" (University of Bristol, 2019).

Given the scientific community's consensus that global mean SLR will continuously accelerate for several centuries (IPCC, Special Report on Climate Change and Land, 2019) and likely reach multimeter levels as early as late this century (Hansen et al., 2016), the need to relocate coastal communities and infrastructure out of hazardous coastal zones is of critical socioeconomic importance nationwide. Despite several years of debate, limited policy and

funding solutions exist. In Hawai‘i, where coastal erosion rates are projected to double within half a century (Anderson et al., 2015), beachloss has long been a source of conflict between those who advocate for the protection of public trust lands and those who enforce coastal zone management laws. This problem is urgent and has reached crisis levels in some locations (Figure 1).



Figure 1) Rocky Point, North Shore O'ahu

On O'ahu alone, protecting property from coastal erosion using seawalls and revetments has led to the narrowing of 17.3 km and complete loss of 10.4 km of sandy shoreline between 1928/1949 and 1995, a combined 24% of the original sandy shoreline (Fletcher et al., 1997). Despite the stated objectives of federal, state, and county coastal zone

policies to preserve the health and access to sandy beaches, current local coastal policies fail to do so (Summers et al. , 2018), although recent legislative actions (reviewed later) promise increased protection for sandy shorelines.

This thesis will review the history, significant legal decisions, and present-day dilemmas that characterize the federal, state, and county coastal management regime in Hawai'i. Following an analysis of these factors, pathways for a managed retreat from the shoreline will be discussed. The policy framework supporting managed retreat, while studied from a theoretical point of view, is poorly developed in reality and functional options and practical solutions for coastal managers do not yet exist.

Here, managed retreat is broadly defined as the relocation of infrastructure and people from hazard prone areas to safe areas, typically at higher elevation or further back from the coastline. As often conceived among planners, managed retreat employs an extensive list of policies aimed at incentivizing or assisting relocation, or disincentivizing the further development or redevelopment in coastal areas all while balancing coastal property rights and public trust issues. We argued that a well developed managed retreat plan is necessary for the C&C of Honolulu to realign current coastal management practices with the goals offered in federal, state, and county CZM policy.

2.0 BACKGROUND

2.1 SEA-LEVEL RISE IN HAWAII

In Hawai'i, long-term SLR is recorded by a network of tide gauges maintained by the UH Sea Level Center on the Mānoa campus. The Honolulu tide station has been in operation since the beginning of the 20th century and is one of the longest operating stations in the world. The full record of sea level change at the Honolulu tide station shows a long-term rise of 1.51 ± 0.21 mm/yr (<https://tidesandcurrents.noaa.gov/sltrends/sltrends>, accessed on June 13 2020).

A mission involving satellite altimetry was launched in 1993 and has now accumulated a 27 yr record of global sea surface change. Over the period of satellite altimetry the mean rate of global sea level change is 3.4 mm/yr. Over the same period, data from the Honolulu tide station shows a water level change of 2.1 mm/yr (<https://ccar.colorado.edu/altimetry>, accessed on June 13 2020). Although sea level in the Pacific basin is known to display periods of high variability as a result of physical processes (Pacific Decadal Oscillation, El Nino Southern Oscillation) operating on a range of time scales, the difference between the rate of global SLR and the rate recorded by the Honolulu tide station is not fully understood. Hamlington et al. (2016) provide a description of decadal scale sea-level dynamics in the Pacific basin, which could play a role in the observed differences between global and local (Honolulu) rates of SLR.

Gravitational pull on the ocean surface by Greenland and Antarctic ice sheets, and mountain glacier systems, is reduced by melting. The resulting drop in sea level near these ice centers is compensated by increased SLR in the tropics. Compared to the global mean,

differential SLR in Hawai‘i grows with higher levels of melting. The theory that models this phenomenon is called “sea-level fingerprinting.” Studies indicate Honolulu may experience rates of sea-level change exceeding 8 mm/yr in the second half of the century as a result of this process (Spada, Bamber, and Hurkmans, 2013).

The Honolulu urban core is an epicenter of economic growth. It is a densely populated coastal community that continues to experience increased tourism, population growth (post 2010), investment-backed development, and city funded infrastructure improvement plans such as the Honolulu Complete Streets program. The urban core serves as the workplace for thousands of people who live across the island, many of them in coastal residential communities. Ongoing SLR will expose growing numbers of these residents and supporting infrastructure to coastal hazards. These hazards include: saltwater intrusion and changes in coastal ecosystems and aquifers (Masterson et al., 2014); marine and groundwater inundation (Habel et al. 2020); seasonal and storm-related high-wave flooding (Anderson et al., 2018); and coastal erosion (Summers et al. 2018, Anderson et al. 2015). The impacts of SLR are additionally amplified by extreme water levels informally called king tides. Vitousek et al. (2017) find that global mean SLR expected by 2050 will more than double the frequency of extreme water-level events in the tropics, directly impacting Hawai‘i and other low-lying Pacific island nations. Consequently, various coastal businesses, roads and highways, critical underground utility systems (freshwater, sewage and utilities pipes), sewage treatment plants, power plants, and residential dwellings—which are already wrestling with difficult adaptation responses such as strategic managed retreat—are threatened by SLR.

2.2 HAWAII'S COASTAL ZONE MANAGEMENT REGIME

During a period of enhanced worldwide awareness of environmental issues, the Straton commission, formally known as the commission on Marine Science, Engineering and Resources, was charged by Congress with drafting a report (*Our Nation and the Sea*, 1969) regarding the management of our nation's marine resources, including coastal zones. The commission was tasked with understanding the role that the United States played with regards to the management of world ocean resources. Among its conclusions was a recommendation that the nation's coastal zone was in need of an enhanced system of management.

Congress responded by enacting several pieces of environmental legislation including the Coastal Zone Management Act (CZMA) of 1972 (Knauss, 2004). Unlike other federal environmental programs of the time, participation by states was voluntary. Congress created an incentive program in the form of grants-in-aid to encourage states to develop and implement CZM programs that “preserve, protect, develop, and where possible, to restore or enhance the resources of the nation's coastal zone”(16 U.S. Code § 1451-1466). Under the CZMA, states are encouraged to involve local jurisdictions in the creation of coastal management plans and policies to foster cooperation among federal, state, and local governments (Nolon, 2012).

In 1977, as one of the first states to participate in the national program, Hawai'i passed Hawai'i Revised Statutes Chapter 205a (HRS § 205a) to “provide for the effective management, beneficial use, protection, and development of the coastal zone” (HRS § 205a

1-49). Through this statute, the coastal zone is managed by state and local agencies via three main policies; 1) Local zoning ordinances that establish approved uses, densities, and height limits, 2) Special Management Areas (SMA) that designate coastal regions subject to heightened regulations on development, and 3) Shoreline Setbacks which designate a development prohibition zone defined by a minimum distance from the “certified shoreline” (Summers et al, 2018).

In HRS § 205a (as amended in 2020) “shoreline” is defined as “the upper reaches of the wash of the waves, other than storm or seismic waves, at high tide during the season of the year in which the highest wash of the waves occur, usually evidenced by the edge of vegetation growth, or the upper limit of debris left by the wash of the waves.” This migrating boundary, also commonly referred to as the “administrative shoreline” or the “certified shoreline” establishes the jurisdictional partition between State Conservation District lands (seaward of shoreline) and the County Special Management Area (landward of shoreline).

2.3 EVOLUTION OF THE SHORELINE CERTIFICATION PROCESS

The shoreline certification process has historically been subject to abuses by coastal land owners. Between the 1980s and early 2000s, the public and resource conservation managers became increasingly aware of widespread administrative erosion of the shoreline. Administrative erosion is the loss of public conservation lands (e.g. beaches) as a result of the actions of the state in certifying a shoreline that does not accurately follow the upper reach of the wash of the waves, as defined by law.

The shoreline certification process is governed by a set of rules (Hawai'i Administrative Rules § 13-222) that are periodically updated and promulgated by the Hawai'i Department of Land and Natural Resources (DLNR). Prior to 2002, when the certification rules were rewritten, this process was seen by the public as having three primary faults. These faults are:

1. **Conflict of Interest:** The rules require private property owners to be responsible for hiring surveyors to identify the location of the shoreline. The day the survey is to be conducted is published in the Office of Environmental Quality Control Bulletin. The public is invited to attend the survey and observe the staking of the shoreline. Despite this public process, the land owner may be present and has the opportunity to influence the placement of the stakes. This and the fact that the surveyor is paid by the landowner is considered a conflict of interest.
2. **Lack of Training:** No formal training was provided to surveyors to recognize evidence of the upper reach of the wash of the waves. This led landowners to use irrigation and landscaping in order to advance the vegetation line seaward. This afforded more square footage for development, potentially worth hundreds of thousands of dollars in the final asking price of a finished building. Surveyors had been observed staking the falsely landscaped shoreline.
3. **Lack of Enforcement:** Policing and enforcement of landscaping and shoreline hardening continues to be difficult given restrictions in department funds and the remote nature of many beachfront parcels. Still today, enforcement largely relies on

public complaints but is augmented by regular inspections of coastal parcels by resource managers. This lack of checks and balances was, and continues to be, a vulnerability in the certification process.

In 1997 a research paper published by the UH Coastal Geology Group (Fletcher et al., 1997) identified shoreline hardening as being responsible for beach loss on O‘ahu. For decades both state and county agencies had been awarding permits for construction activities (seawalls) on beaches across the state. At the time, DLNR director Michael Wilson realized with Fletcher et al. (1997) that the mission of his agency to protect natural resources conflicted with their regular granting of permits for shoreline hardening. Director Wilson asked Professor Charles Fletcher and DLNR planner Sam Lemmo to engage in a community-based awareness building process and to visit communities across the state as the first step in creating a new Coastal Lands Program (CLP). As a second step Fletcher and Lemmo authored the Coastal Erosion Management Plan (COEMAP, 1998). COEMAP laid out a series of goals and milestones to be achieved by the CLP, which still guides long term planning at CLP today.

In response to Fletcher et al. (1997) and pressure by grassroots organizations such as Public Access Shorelines Hawai‘i (PASH), DLNR began to implement a more scientifically based certification process. This process was embedded in the CLP and soon became part of the Office of Conservation and Coastal Lands (OCCL). Working with UH Manoa Sea Grant, OCCL stationed an extension agent with expertise in coastal processes in its office. There are now coastal-processes extension agents located in the planning offices of the counties of Kauai and Maui. In addition, a coastal-processes extension agent is embedded with the Waikiki

Improvement Association to assist with beach management. These agents are tasked with creating a more scientifically valid administrative process for identifying the certified shoreline. This process involves workshops and training opportunities for the professional survey community as well as training for state employees in the Department of Accounting and General Services (DAGS), where the state survey office is located.

Over the course of the late 1990s and into the early 2000s the shoreline-certification process became more reflective of what the law originally intended. Currently, the practice of a state surveyor accompanying privately hired surveyors attempts to control the property owners' conflict of interest when identifying the shoreline. Unfortunately, regulating artificial property line placement through unlawful irrigation and landscaping relies largely on public complaints and inspections by resource managers which can be infrequent. In 2005, funded by the OCCL, Dennis Hwang authored the Hawai'i Coastal Hazard Mitigation Handbook that described a list of shoreline certification best practices. Over the past 15 years these practices have been organically standardized, becoming the *de facto* method for new shoreline certifications across the state.

Hawai'i's Supreme Court plays an essential role in the continued improvement of the state's shoreline certification process. Three landmark decisions, 1) *County of Hawai'i v. Sotomura* (1973), 2) *Diamond v. State Board of Land and Natural Resources* (BLNR) (2006), and 3) *Diamond v. Dobbins* (2014) were especially significant in shaping the process seen today.

The first decision, *County of Hawai'i v. Sotomura*, dates back to 1973. In this case the court supported the interpretation of HRS § 205A that the shoreline should be certified at the

highest reach of the highest wash of the waves. It was held that “where the wash of the waves is marked by both a debris line and a vegetation line lying further mauka (landward) [,] the presumption is that the upper reaches of the wash of the waves over the course of a year lies along the line marking the edge of vegetation growth.” A gross misinterpretation of this decision led many property owners and surveyors to believe that regardless of the upper reach of the wash of the waves, the vegetation line was the newly accepted certifiable shoreline.

In an attempt to shift property boundaries seaward and thus increase the available footprint for development, some coastal property owners engaged in the planting and irrigation of salt tolerant vegetation such as naupaka and spider lilies. In *Diamond v. BLNR*, the use of an artificial vegetation line located makai (seaward) of the upper reach of the wash of the waves to determine the “shoreline” was questioned by Caren Diamond, a resident of Kaua‘i. The court’s decision can be summarized in three main parts.

1. Upper Reaches of the Wash of the Waves: The court suggested that the definition of shoreline in HRS § 205a be amended with a clarification that requires the shoreline to be determined at the time when the upper reaches of the wash of the waves would be at their highest.
2. The Vegetation Line vs the Debris Line: The court held that vegetation growth as evidence of the shoreline does not prevail over the debris line as evidence of the highest wash of the waves. The BLNR’s interpretation of *Sotomura*, that the vegetation line was intended to trump the debris line, was seen by the court as erroneous. The court stated that the *Sotomura* decision clearly favored the public policy of extending “as

much of Hawai'i's shoreline as is reasonably possible" to public ownership. Based on public policy favoring shoreline access, the court supported the decision to use the most mauka line.

3. Vegetation Growth: The paramount issue raised by *Diamond* was the use of "vegetation growth" as evidence of the shoreline. The court found that the use of artificially planted vegetation in determining the certified shoreline encourages property owners to plant and irrigate vegetation to extend property boundaries further makai. This was determined to be contrary to the objectives of HRS § 205a. Additionally, the court confirmed that planted vegetation's survival for multiple years does not deem it "naturally rooted and growing" and thus excluded it from the definition of "vegetation growth."

In conclusion *Diamond v. BLNR* reconfirmed public policy ascribed in HRS § 205a and adjudicated upon in *Sotomura*, rejecting attempts by coastal property owners to artificially extend vegetation lines on their property.

Carren Diamond appealed yet another shoreline certification on Kaua'i in *Diamond v. Dobbin* (2014). In this case Diamond argued that previous years evidence of the upper reach of the wash of the waves should be considered in the determination of the "shoreline." The Hawai'i Supreme Court supported this opinion, affirming that the use of previous years' high-wave evidence is consistent with the intent of HRS § 205a. Secondly, the court held that the "shoreline" can be evidenced by "members of the public that have personal knowledge and

familiarity with the shoreline conditions of the subject property.” Previous evidence, current evidence, and public testimony are now all considered in determining the shoreline.

Through the cooperation of University of Hawai‘i researchers, community groups, and the legislative and judicial branches of Hawai‘i, the shoreline certification process continues to evolve as SLR brings more coastal properties into contact with the sea. Amended in 2020, the definition in HRS § 205a now reads, “the upper reaches of the wash of the waves, other than storm or seismic waves, at high tide during the season of the year in which the highest wash of the waves occurs, usually evidenced by the edge of vegetation growth, or the upper limit of debris left by the wash of the waves.” This is now more in line with the legislature’s intent to reserve as much of the shoreline as possible to the public.

2.4 LOCAL SETBACK POLICY

After the National CZM Program was established in 1977, several states opted to participate in a federal-local partnership designed to encourage states to create coastal management plans and policies to foster federal, state and local cooperation. To manage the coastal zone in Hawai‘i, the State created a minimum shoreline setback (20 ft) for shallow lots where the depth of the buildable area is less than 30 feet (HRS § 205a). For deeper lots, the setback is 40 ft. The setback is measured from the administrative shoreline. State conservation districts have a setback of 40 ft + 70 times the average annual coastal erosion rate, for parcels with average lot depth greater than 200 ft.

HRS § 205a-45 allows counties to increase their setback beyond 40 ft from the shoreline. Maui and Kaua'i counties have changed their shoreline setbacks in recognition that 40 ft does not offer sufficient protection from coastal hazards. Both Kaua'i and Maui have adopted setbacks based on either the rate of historical shoreline change or the average depth of the lot.

On Kaua'i, the shoreline setback is:

- 40 ft (12.2 m) + a distance of 70 times the annual coastal erosion rate + a 20 ft (6.1 m) safety buffer measured from the shoreline for lots with a depth less than 140 ft (42.7 m).
- For lots with an average depth of 140 to 220 ft (42.7 to 67.1 m), the greater distance of the following two scenarios applies: 40 ft (12.2 m) + 70 times the annual coastal erosion rate + 20 ft (6.1 m), or taking the average lot depth, subtracting 100 ft (30.5 m), dividing by 2 + 40 ft (12.2 m).
- For lots with an average lot depth over 220 ft (67.1 m), the greater of the following two scenarios shall apply: 40 ft (12.2 m) + 70 times the annual erosion rate + 20 ft (6.1 m), or a setback line of 100 ft (30.5 m) from the shoreline.

On Maui, all lots have a shoreline setback that is the greater of:

- 25 ft (7.6 m) + a distance of 50 times the annual erosion hazard rate.
- Based on the lot depth:

- o Lots with average depth of 100 ft (30.5 m) or less shall have a setback of 25 ft (7.6 m).
- o Lots with average depth >100 ft (30.5 m) but <160 ft (48.8 m) shall have a setback of 40 ft (12.2 m).
- o Lots with average depth >160 ft (48.8 m), shall have a setback of 25% of the average lot depth, but not >150 ft (45.7 m).
- For irregularly shaped lots, the setback will be equivalent to 25% of the lot depth as determined by the Director of Planning to a maximum of 150 ft (45.7 m).

Table 1 on the next page summarizes the current setback policies for Hawai'i's four counties.

TABLE 1 – Hawai'i Counties Setback Delineation			
County	Erosion Rate-Based	Fixed-Distance	Area/Other Methods
O'ahu	Conservation Districts only (DLNR)*	40 ft (12.2 m) inland from the certified shoreline(32)	n/a
Maui	The greater of the distances from the shoreline as calculated under the methods listed or the overlay of such distances(33)		
	25 ft (7.6 m) + distance of 50 times the annual erosion hazard rate from the shoreline	Based on the lot's depth as follows: 1) Lots with average depth of 100 ft (30.5 m) or less shall have a setback 25 ft (7.6 m) from the shoreline 2) Lots with average depth >100 ft (30.5 m) but <160 ft (48.8 m) shall have a setback 40 ft (12.2 m) from the shoreline 3) Lots with average depth >160 ft (48.8 m), shall have a setback equal to 25% of average lot depth, but not >150 ft (45.7 m) 4) For irregular lots, or cliffs, bluffs or other topographic features inhibit safe measurement of boundaries and/or the shoreline, the setback will be equivalent to 25% of the lot depth as determined by Director of the Department of Planning to a maximum of 150 ft (45.7 m) from the shoreline	
NOTE: Maui Department of Planning introduced a new set-back criteria for Maui island, the erosion hazard line (see PacIOOS SLR Viewer) marking 80% probability of exposure to chronic erosion when sea level has risen 3.2 ft (~1 m).			
Kaua'i	For lots in the Kaua'i Erosion Study(34) 1) For lots with average depth of <140 ft (42.7 m): 40 ft (12.2 m) + distance of 70 times annual coastal erosion rate + 20 ft (6.1 m) safety buffer from certified shoreline 2) For lots with average depth of 140 ft (42.7 m) to 220 ft (67.1 m), the greater setback of the following: 40 ft (12.2 m) + 70 times annual coastal erosion rate + 20 ft (6.1 m), or taking average lot depth, subtracting 100 ft (30.5 m), then dividing by 2 + 40 ft (12.2 m) 3) For lots with average depth greater than 220 ft (67.1 m), the greater setback of the following: 40 ft (12.2 m) + 70 times annual coastal erosion rate + 20 ft (6.1 m), or a setback of 100 ft (30.5 m) from the certified shoreline	n/a	For lots <u>not</u> included in the Kaua'i Erosion Study, the setback shall be calculated by the following formula(35): Average Lot Depth - 100) / 2 + 40), subject to the following: 1) For lots with naturally occurring rocky shorelines, the shoreline setback line shall be no less than 40 ft (12.2 m) 2) For all other lots, the shoreline setback line shall be no less than 60 ft (18.3 m) 1) 3) For all lots, the maximum setback that can be required shall be 100 ft (30.5 m)
Hawai'i	In Conservation Districts only (DLNR)*	40 ft (12.2 m) inland from the certified shoreline	n/a

Table 1) Honolulu Climate Change Commission, "Guidance on Revisions to the REvised Ordinance of Honolulu Chapter 23, Regarding Shoreline Setbacks" (2019)

The City and County of Honolulu is responsible for governing the island of O'ahu, the most densely populated Hawaiian island. Revised Ordinances of Honolulu (ROH) Chapter 23 is the shoreline setback provision for the City. The purpose of ROH § 23 is to "establish standards and to authorize the Department of Land Utilization (now Department

of Planning and Permitting (DPP)) to adopt rules pursuant to HRS § 91, which generally prohibit within the shoreline area any construction or activity which may adversely affect beach processes, public access along the shoreline, or shoreline open space.”

ROH § 23 sec. 1.2 states that it is the:

primary policy of the City to protect and preserve the natural shoreline, especially sandy beaches; to protect and preserve public pedestrian access laterally along the shoreline and to the sea; and to protect and preserve open space along the shoreline. It is also a secondary policy of the city to reduce hazards to property from coastal floods.

ROH § 23 requires a minimum setback of 40 feet inland of the shoreline with an exception for subdivisions that increases the setback to 60 ft (ROH §23 sec. 1.4 and 1.7). In the case of shallow lots, where the depth of the buildable area is less than 30 ft, the setback is “adjusted to allow a minimum depth of buildable area of 30 ft; provided that the adjusted shoreline setback line shall be no less than 20 ft from the certified shoreline.” In the case of a new subdivision or consolidation of land, new lots must accommodate a 60 ft setback.

ROH § 23 provides authority to the Director of DPP to grant variances for structures or activities within the setback. One such variance known as the hardship standard, is granted in situations where it is found that an “applicant would be deprived of reasonable use of the land” if required to comply fully with the shoreline setback ordinance and rules (ROH §23 sec. 1.8). A key aspect of the hardship standard is determination of “reasonable use of the land”

(Summers et al., 2018). In past practice, reasonable use of the land was found to include improvements such as roads, habitable dwellings, and even the intention of future habitation where no existing improvement was actually threatened. In such scenarios facilities or improvements that may artificially fix the shoreline are allowed. Under these conditions, discretionary allowances have been made for seawalls, revetments, and other shoreline hardening structures that clearly undermine the primary policy objective. As documented by numerous studies, hardening leads to accelerated beach erosion and eventual beach loss (Fletcher et al. , 1997; Bromine and Fletcher, 2012; Summers et al., 2018; Tavares et al. , 2020). In an era of rapidly accelerating SLR one must ask if building on sandy shorelines constitutes “reasonable use” of the land. This situation emerges from not only the local and state coastal zone management approach but the federal program that annually promulgates CZM activities with monetary grants.

2.5 CURRENT LOCAL LEGAL ENVIRONMENT

In December of 2017, the chair of DLNR—responsible for managing conservation lands including beaches and submerged lands—requested that the Hawai‘i State Attorney General provide an opinion with regard to ownership and DLNR responsibility in the case of retreating shorelines driven by SLR. Former Hawai‘i State Attorney General Douglas S. Chin provided an opinion containing the following:

- That “public interests remain protected as the shoreline retreats.” This means that the State of Hawai‘i owns all land makai of the “shoreline” (as defined in HRS § 205a) even as the “shoreline” migrates inland.
- The state “owns an inchoate interest in the land that might be gained through erosion or sea level rise.”
- The loss of private property through the inland movement of the “shoreline” does not “constitute a “taking” of private property.” The Hawai‘i Supreme Court has “considered and rejected such claims.”
- The Attorney General is not required to approve state ownership of land as “shoreline” migrates inland.
- The BLNR “should charge former owners fair market value in return for an easement interest in the land.”

In 2018, Honolulu Mayor Kirk Caldwell requested that the Honolulu Climate Change Commission provide guidance to the city on the subject of SLR. Guidance was provided recommending that Honolulu plan for 3.2 ft of SLR by the end of the century, and for projects that have low risk tolerance, plan for 6 ft of SLR. The guidance also suggested that coastal areas that would be flooded by 3.2 ft of SLR will begin to see extreme tide flooding before mid-century. The City and County of Honolulu should use the Hawai‘i Sea Level Rise Vulnerability and Adaptation Report in addition to the online map server that shows SLR impacts across the state. On the basis of this guidance, Caldwell issued Directive 18-02 on July 16, 2018 calling for all city departments and agencies to take action to address and minimize

“risks from, and adapt to the impacts of climate change and sea level rise.” Despite the aforementioned actions of local government officials, there is currently no long-term management plan that will ensure the longevity of O‘ahu’s beaches in a future of uncertain sea-level rise. A study at the University of Hawai‘i (Tavares et al., 2020) modeled future SLR and shoreline hardening and found that by mid-century a potential 40% of beachfront lands could be hardened under current policy. It is inevitable that already hardened coastlines will lead to complete beach loss as rising oceans meet seawalls and revetments. Homes standing unprotected, such as those along Sunset Beach on the north shore of O‘ahu, will become increasingly susceptible to chronic yearly flooding and structural undermining.

In response to sea-level rise and other climate change threats, the Hawai‘i state legislature passed Senate Bill (SB) 559 (2017), creating the Hawai‘i Climate Change Mitigation and Adaptation Commission. The Commission is charged with:

1. Developing vulnerability and adaptation reports on the effects of SLR
2. Setting goals and strategies for mitigation and adaptation
3. Identifying climate vulnerabilities across all sectors in the state
4. Assessing current efforts and capacity of existing resources
5. Tracking the implementation progress.

Subsequent studies report that anthropogenic SLR is set to cost the state \$15 billion in coastal highway repairs and modifications, and \$12.9 billion in coastal private property damage on Oahu alone (Sea Level Rise Vulnerability and Adaptation Report, 2017).

In October of 2019 during his seventh State of the City address Mayor Caldwell announced placing a moratorium on private seawalls as one of his top priorities. The mayor has yet to formally issue an executive directive on the matter. Both mayoral candidates vying for his position have been silent on the issue. Under mayoral advisory the DLNR has since denied all private seawall permits under the hardship variance. While the Honolulu CCC has produced a white paper with recommendations for amending setback policy (ROH § 23), the recommendations do not include a concise ban on all future seawalls.

In September of 2020, Hawai‘i’s Governor David Ige signed SB 2060 into law which amends the states coastal management statute (HRS 205a). The law prohibits “private shoreline hardening structures such as seawalls and revetments, at sites with sand beaches and at sites where shoreline hardening structures interfere with existing recreational and waterline activities.” The bill also expands state coastal ecosystem protections to include protecting “beaches and coastal dunes, from disruption and . . . adverse impacts.” What may now be considered one of the most progressive legislative seawall prohibitions in the nation has set the stage for counties to follow suit and update local setback policy to align with these new state regulations.

Recent amendments to HRS 205a—along with the creation of the Hawai‘i Climate Change Commission, SLR based directives from Mayor Caldwell, and the opinion put forth by Douglas Chin—all support the notion that Hawai‘i’s legal environment is moving towards better stewardship of our natural resources. These are the necessary signs, on the part of

government, that now is the time to move forward and take serious steps towards developing a comprehensive managed retreat plan.

Having established the Hawai'i coastal zone management regime and history, in order to set context, the remainder of this thesis provides a review and analysis of options for managed retreat in response to SLR.

3.0 MANAGED RETREAT POLICY TOOLS

3.1 SETBACKS AS A RETREAT CATALYST

Shoreline setbacks are a standard policy for every coastal management program and play a critical role in assisting managed retreat efforts. This type of regulatory policy can be thought of as a form of on site retreat and allows policy makers to both protect future development as well as the health of, and access to, sandy shorelines (Georgetown Managed Retreat Toolkit, 2020).

In Hawai'i the county setback policies both define the physical setback distance as well as the permit criteria for developing a parcel. The current setback (40 feet), employed by the C&C of Honolulu (ROH § 23), has not been significantly modified for a decade and fails to incorporate a current understanding of the risks associated with SLR and aspects of climate change that increase coastal hazards (C&C of Honolulu Climate Change Commission, 2019). In light of SB 2060, ROH § 23 is no longer in agreement with the prohibitions on private shore protection structures as put forth by HRS § 205a. Furthermore the Hawai'i public trust doctrine declares that “[t]he state has a duty to ensure that these lands (beaches) are utilized in

a manner benefiting the public, and to prevent any use substantially impairing this trust.” So as to achieve consistency between the goals of the State CZMA (HRS § 205a), local setback policy (ROH § 23), and the public trust doctrine, the C&C of Honolulu should consider amendments to ROH § 23. Fortunately, the availability of historic coastal erosion data and existing policy frameworks employed by nearby Maui and Kauai Counties make amending O‘ahu’s setback policy a logical starting point for developing a managed retreat plan. The suggested amendments are as follows:

1. Design a place-appropriate setback regime. The current setback is a 40 foot one-size fits all approach. This blanket regulation does not consider the varying geologies and backshore developments found across the island. While some coastal segments are characterized by sandy beaches, critical habitats, and recreational areas, others are already developed and hardened. The fundamental differences between hardened shorelines and open shorelines suggests that a single setback regime is inappropriate. Examples of variable setbacks include, but are not limited to:

- 1.1. Erosion-based setbacks: Maui and Kauai Counties employ erosion-based setbacks that reflect site-specific erosion hazards based on empirical data (Table 1).
- 1.2. Applying consistent setbacks to coastal segments that share common ecological and physical characteristics.

- 1.3. Use of model results that identify coastal hazards influenced by climate change. An example is the UH PacIOOS SLR viewer that displays a “red line” simulating the 80% erosion probability under 3.2 ft of SLR. A combination of these approaches is recommended.
2. **Utilize multiple criteria to determine the setback, and choose the greatest amongst them.** Both Maui and Kauai counties utilize multiple criteria in their setback rules to determine the setback: lot depth, historical erosion rates, and future erosion hazards (Table 1). The use of multiple criteria increases the probability in achieving policy objectives.
3. **Eliminate the hardship variance.** Section 1.8 of ROH § 23 enables private coastal property owners to artificially harden their shoreline with a hardship variance. Coastal hardening on Oahu has been consistently linked to beach loss and erosion (Fletcher et al. , 1997; Bromine and Fletcher, 2012; Summers et al., 2018; Tavares et al. , 2020). In a recent legal analysis authored by a Richardson School of Law student Collin Lee, it was concluded that “coastal landowners did not have the right to destroy public trust beaches and the City did not, and does not, have the right to permit them to do so.” Lee asserts that eliminating the hardship variance, effectively prohibiting private shore protection structures, may not deem the city “liable to coastal land owners for regulatory takings.” Eliminating the hardship variance would also align the objectives of

the cities setback policy with state CZMA regulations. The city is both obligated and legally authorized to prohibit shoreline protection structures.

4. Develop strict rules surrounding the repair and maintenance of legacy

seawalls. Legacy seawalls are nonconforming or legally permitted walls that harden the shoreline on sandy beaches and presently or in the near future, negatively impact the natural environment, public access, open space, and other public trust characteristics. The repair of legacy seawalls and revetments continues the poor management practice of shoreline hardening. Recent legal analysis contends that “the public trust doctrine “empowers the [City] to revisit prior” lawfully permitted artificial shoreline hardening measures – “even those made with due consideration of their effect on the public trust” (Collin Lee, 2020 (awaiting publication); U.S. CONST. amends. V, XIV). Effectively, the city can develop strict regulations on private seawall repairs using the existing policy framework of ROH § 23 to “revisit” the legality of existing seawalls. This would enact a regulatory process allowing the gradual phasing out of aging and deteriorating private shoreline protection structures. While it is still unclear if the public trust doctrine mandates the city to require the removal of existing seawalls that adversely affect beach processes, strictly regulating the repair of existing seawalls can reach a similar goal. Areas where shoreline hardening should be maintained (e.g., where in the best interest of the public, in support of clean nearshore waters, to protect vital public

infrastructure, etc.) can be identified and supported through area-specific criteria. Given the current political atmosphere and recent amendments to HRS § 205a it is likely that the removal and/or pashing out of legacy seawalls will be a primary obstacle to protect beaches.

Implementing a shoreline setback policy that includes erosion based setbacks, bans on future sea walls, and restrictions on legacy seawall repairs is essential to a comprehensive managed retreat plan. The immediate intention of setback policy is not to relocate structures or abandon land, but strong setback policies can create an environment in which this happens over time. In this way, strong setback policy is an essential catalyst to long-term managed retreat, and must be in place before further action is taken. Amending ROH § 23 using the above considerations sets a legal precedent. The precedent: Future buildable areas within coastal lots will be greatly reduced; private coastal homes will not be permitted shore protection; and repairing existing walls will not be sanctioned .

When coastal homes are no longer allowed shore protection structures, their true property values will be accurately reflected in market prices. This will transfer the public “cost” (beach loss) to the private sector. Meanwhile, declining coastal property values play a critical role in disincentivizing further investment in coastal properties. In the future, if governments decide to financially assist homeowners in relocation, the amount of assistance will likely be based on property values. Lowered property values that accurately account for vulnerabilities due to SLR will ensure less tax payer money is used in the process of property abandonment.

In the scope of possible managed retreat policy techniques, revamping sections of ROH § 23 is a low effort objective that is scientifically sound and legally acceptable. The willingness on behalf of policy makers to quickly implement these amendments will be a litmus test as to whether the city has the intention of protecting sandy shorelines as required under the public trust doctrine.

It is imperative for the city to understand that even the most progressive shoreline setbacks offer no long-term benefit to resolve the underlying problem of protecting public beaches from private artificial shoreline hardening (Reed, 2009). Instead, they “only delay the clash of public and private interests” (Reed, 2009). That being said, a strong setback policy scheme can afford policymakers the much needed time to draft and implement more robust shoreline retreat measures.

3.2 VOLUNTARY BUYOUT PROGRAMS

In the United States the primary method of government-funded retreat has been through voluntary buyouts of hazard-prone properties (Zavar and Hagelman, 2016). These land and property acquisitions are generally funded by the Federal Emergency Management Agency (FEMA) through Hazard Mitigation Assistance (HMA) programs and are administered by state and local governments. The Small Business Administration (SBA) and Department of Housing and Urban Development (HUD) also fund property acquisitions, though on a much smaller scale. Nearly all FEMA sponsored buyout programs occur post disaster in Midwestern riverine floodplain communities as well as along hurricane-prone

coastlines throughout the eastern seaboard and Gulf states. While buyouts have historically “been conducted as one-off reactions to hurricanes”, a growing number of states are opting to create permanent buyout programs that target communities prone to repeat disasters both before and after disaster strikes (Schwartz, 2018).

A common procedure takes place after federal and state agencies approve a buyout program whereby the government: purchases property from obliging sellers, demolishes existing structures, bans future development on the property (e.g. through dead restriction or conservation easement), and ensures that the land is reverted to open space in perpetuity (Georgetown Managed Retreat Toolkit, 2020). Depending on the details of the grant, FEMA funds can be used to relocate structures, most commonly single story wood frame houses (Federal Emergency Management Agency, 2005).

To obtain funding from FEMA HMA programs, state and local governments need to have approved hazard mitigation plans (C&C of Honolulu Multi-Hazard Pre-Disaster Mitigation Plan, 2019). These plans identify and prioritize hazard mitigation actions and must be updated every five years in order to maintain funding eligibility. It is within these hazard mitigation plans that state and local governments put forth their broad intent on how FEMA funds will most likely be allocated.

In Hawai‘i—government-sponsored community buyout programs have been accomplished in only two cases—both on Hawai‘i Island.

1. In 1960, a tsunami devastated the town of Hilo, Hawai‘i. In response Hawai‘i County deemed inundated portions of downtown Hilo inappropriate for

development due to persistent risks of future hazards and created the Urban Renewal Plan for the Kaiko‘o Project (1965). The project designated elevated and open space sections of Hilo to have limited commercial and industrial development and forbade residential use permits. The Hawai‘i Redevelopment Agency used federal disaster recovery funding to acquire all real property in the area at fair market value. Like most buyout programs nationwide the plan did not designate specific relocation areas for displaced residents.

2. In May of 2018, a four month lava flow began, originating from the East Rift Zone on Hawai‘i Island’s Kīlauea volcano (<https://www.staradvertiser.com>, accessed on June 1, 2020) Long lasting lava flows and eruptions destroyed 700 homes, covered 6,000 acres of land in lower Puna, and caused severe damage to roads and crops (<http://www.hawaiinewsnow.com>, accessed on Oct. 5 2020). Hawai‘i County is responding with a Voluntary Housing Buyout Program using \$78 million in funding from U.S. Department of Housing and Urban Development Block Grants (<https://www.hawaiitribune-herald.com> , accessed on Oct. 13, 2020). According to Disaster Recovery Officer Douglas Le the program, anticipated to start in April 2021, will acquire property from willing owners at pre-disaster values with a cap of \$230,000 per parcel regardless of the current state of the property. The program will prioritize primary residences, then secondary residences, and lastly undeveloped residential parcels (<https://www.hawaiitribune-herald.com> , accessed on Oct. 13, 2020).

Both buyout programs described above are examples of post-disaster retreat efforts on the part of local governments in response to two different natural disasters (tsunamis and lava flow). While science cannot accurately predict exactly when tsunamis or lava flows will happen, locations that are at higher risk due to these phenomena are already established. Because tsunamis and lava flows are singular disasters that happen once in many years, property owners should inherit the risk of building in these areas. Because of this, it is arguable that reactionary (vs proactive) measures by local governments can be acceptable.

While some hazards due to extreme events (tsunamis and lava flows) cannot be predicted, hazards associated with SLR can be assumed as continuous and accelerating given that SLR has been scientifically projected to be continuous and accelerating for centuries. Scientists use historical data and future models to predict, with high accuracy, when and where coastal erosion and flooding due to sea level rise will create hazardous conditions for coastal properties and residences. Tavares et al. 2020 projected shoreline erosion to mid-century (using modeling in Anderson et al. 2018) and found that if current management practices continue as much as 40% of the sandy beaches on O‘ahu are at risk of loss. In the case of buyout programs targeting coastal parcels where structures are threatened but not yet damaged, the argument that proactive buyout measures are more appropriate is viable. This requires the following assumptions:

1. **Local governments have the intent to allocate federal hazard mitigation or disaster relief funding to pre-disaster coastal property acquisition.** Neither the State of Hawai‘i 2018 Hazard Mitigation Plan or the Honolulu 2019 Multi-Hazard

Pre-Disaster Mitigation Plan put forth any intent to develop a program of this sort.

The assumption is false.

2. Government-sponsored buyouts of coastal properties are considered financially

and ethically responsible. The Honolulu 2019 Multi-Hazard Pre-Disaster

Mitigation Plan categorizes coastal flooding mitigation actions as a high priority but

offers no mention of buyout programs in their suggested actions. The plan rates the

relative hazard severity of individual hazards based on the annual average loss estimates

in dollars per year. Hazards from hurricane winds are estimated to cost \$410

million/year, nearly 3 times the cost of all other hazards combined. In theory,

relocating houses away from the shoreline would mitigate property damage from

hurricanes, but the plan does not suggest this. It is readily apparent that, from the

point of view of the C&C of Honolulu, the assumption that coastal property buyouts

are financially responsible is false. The city simply cannot afford to purchase

high-valued coastal properties amid an abundance of more urgent, high-priority hazard

mitigation actions. Furthermore while the public supports measures to abate beach

loss from the erosion caused by hardened properties, using taxpayer money to buyout

parcels is highly unpopular. Government buyouts “produce a moral hazard by creating

a safety net assurance. This is because the person deciding how much risk to take on

(property owner) is not the same person who will bear the cost of that risk if it is

manifest (the government)” (Young, 2018). The assumption that buyouts are ethically

responsible is false from both bureaucratic and public perspectives.

Given the high cost of coastal real estate and lack of evidence that the C&C of Honolulu intends to allocate any money towards coastal property buyouts it is highly unlikely that federal disaster relief and hazard mitigation funds will be used to purchase coastal properties. Evidence that the city intends to use these funds to create a buyout program framework that could be used in the future to respond more quickly to disasters is also lacking. As evidenced by history, counties tend to react after disasters taking years to engage in any type of buyouts.

The state of Hawai'i also engages in property buyouts through the Hawai'i Legacy Land Conservation Program (LLCP), run by the DLNR Division of Forestry and Wildlife (DOFW). The LLCP is authorized under HRS § 173a and follows the administrative rules under HAR § 13-140. The program uses a portion of Hawai'i real estate conveyance taxes to distribute grant money to state agencies, counties, and nonprofit land conservation organizations. Grant funds are used to purchase lands, conservation easements, and for paying the debt on "state financial instruments (such as bonds)" for the protection of important resource lands (<https://dlnr.hawaii.gov/ecosystems/llcp/>, accessed on Oct. 19 2020). These lands include: agricultural, coastal, cultural and historic, native habitat, open space and scenic, parks, hunting, and watershed lands. Grants through the LLCP are extremely competitive and are based on the availability of funds as well as the restrictions put forth through the Governor's Executive Biennium Budget Instructions (<https://dlnr.hawaii.gov/ecosystems/llcp/>, accessed on Oct. 19 2020). For projects to be selected they must pass a rigorous annual selection process that includes multiple public

meetings, and approvals from DLNR, BLNR, the State Legislature, and the governor. After approval, county or nonprofit awardees are offered a grant agreement to complete the land acquisition through a contract with the BLNR.

On Oahu, since 2007, the LLCP has engaged in 20 projects, protecting over 12 thousand acres of land using nearly \$18 million dollars in grant money (<https://dlnr.hawaii.gov/ecosystems/llcp/> , accessed sept. 11 2020). Many of these projects were in collaboration with The Trust for Public Land, a national nonprofit organization that fosters partnerships between local nonprofits and government agencies. All coastal lands acquired through these projects were undeveloped and purchased to prevent future development through deed restrictions and conservation easements. The easements tend to be held by the City and/or nonprofit organizations.

The high cost of privately developed coastal parcels and the competitive environment to obtain grants from both federal funds and the state LLCP make it unlikely that local governments will engage in buyouts of such properties. Furthermore, with limited funding, it is more financially responsible for LLCP to purchase cheaper undeveloped and inland agricultural lands. It is also not clear if funding through both of the current mechanisms will increase while the need for such funding will likely rise from increasing hazards due to climate change. Even though privately hardened shorelines place a burden on public trust lands it is evident that this burden is not enough to force government money allocations for property buyouts. Because of this the city should focus on creating market incentives and developing financial assistance tools that spread the cost to the government over time. These types of

managed retreat tools, discussed in the next sections, are essential to compel a managed retreat of developed properties from the shoreline.

3.3 TRANSFERABLE DEVELOPMENT RIGHTS

Transfer of development rights (TDR) programs use financial incentives to shift development from problematic locations (“sending areas”) to those where development is encouraged (“receiving areas”) (Georgetown Managed Retreat Toolkit, 2020). Landowners in sending areas voluntarily sell some or all of their development rights as “TDR credits” through conservation easements. (Easements are discussed in more detail in future sections.) In most cases TDR credits are bought and sold as a commodity separate from the land. Property owners or developers within receiving areas purchase TDR credits to increase the density of future development plans above that dictated by the respective zoning regulations. For example, developers can increase the number of units per square foot or create additional parking spaces. Purchasing TDR credits allows developers in receiving areas to maximize profits and returns on investment. TDR programs also incentivize property owners in sending areas by offering tax cuts or exemptions for dedicating land to conservation use. These programs are generally implemented at a county level adhering to broad state guidelines that authorize local TDR programs and specify their intended use. Historically, local municipalities create TDR programs to specifically discourage growth in agricultural lands, open spaces, and environmentally sensitive areas (Codiga and Wager, 2011).

TDR programs require shorter term start-up investment and ongoing administrative costs. When properly designed, these programs have the ability to reach economic self

sufficiency. Many programs facilitate the sale of TDR credits through a publicly owned and operated “TDR bank.” Run by local governments, TDR banks either 1) purchase development rights at their appraised value directly from sending area property owners, holding them until a buyer is located or 2) act as a marketplace for property owners to “advertise” their TDR credits and facilitate the direct transaction between the buyer and seller. Under the first option, the government carries all risks that arise from a weak market for the purchase of development rights. As a more preferred route, the second option transfers the risk of lowering TDR credit demand to property owners. TDR strategies employing option No. 2 allow a program in which market-based processes are used for public benefit.

Landowners who sell development rights retain ownership and private use of their land and may still be permitted to use the land for agricultural, hunting, and recreational purposes (County of Maui Island Plan, 2009). The original property owner is still permitted to sell the property in the future, but because a conservation easement is at play, development restrictions run with the land in perpetuity.

HRS § 46-161 grants counties the authority to create TDR programs to “protect the natural, scenic, recreational, and agricultural qualities of open lands including critical resource areas” and to “[e]nhance sites and areas of special character or special historical, cultural, aesthetic, or economic interests or value.” While no county currently employs a comprehensive TDR program, the C&C of Honolulu does authorize the transfer of development rights for the “preservation of certain historic properties” (ROH § 21-5.370). In 2012, Maui County approved an updated directed growth plan, “Maui Island Plan”, for 2030

that recommends a comprehensive TDR program (County of Maui Island Plan, 2012). As a suggested action, the creation of a TDR program fulfills the county's objective of preserving parks and open spaces, including shoreline lands (Maui Island Plan, 2012; Codiga and Wager, 2011). While there is no TDR program in place currently, the extent of research done on the topic as evidenced in the 2012 Maui Island Plan for 2030 represents the most progressive TDR plan throughout the state. On Hawai'i Island, the Hamakua Community Development Plan 2016 (CDP) suggests developing a county-wide TDR program. Based on Hawai'i Island's large agricultural economy, the plan aims to use TDRs to redirect development away from agricultural areas and toward designated growth zones. The plan is silent on TDR use for coastal lands. Chapter 5 of the Kaua'i County General Plan, "*Preserving Kaua'i's Rural Character*," states that TDR programs are "complicated to administer and work(s) better in larger jurisdictions with a correspondingly larger pool of buyers and sellers of development rights." The plan acknowledges the benefits of TDR programs but does not consider their use as a feasible policy tool for protecting rural lands. The plan is silent on TDR programs as an option for preserving coastal lands.

While TDR programs have had success nationwide in preserving agricultural and rural lands there are few examples of TDR programs being used for the explicit purpose of managed retreat (Georgetown Managed Retreat Toolkit, 2020). In the context of managed retreat TDR programs could be used in two ways:

1. To create incentives for property owners in sending areas to avoid developing vulnerable coastal properties by selling development rights to increase density of receiving areas.
2. To encourage property owners of already developed lands to remove or relocate structures that act as barriers to the inland migration of beaches and coastal habitats. In this way, a TDR program can be seen as a housing program for the sale of conservation easements in a market setting.

For TDR programs to effectively incentivize development restrictions and structure removal, they must offer sellers of TDR credits worthy financial compensation for the sale of their development rights. In conventional TDR programs, financial incentives direct development away from sparsely populated, more affordable areas, to expensive, urban areas. Here, the difference in property valuation “creates a demand for increased density that drives the sale of TDR credits” (Georgetown Managed Retreat Toolkit, 2020). Conversely, while coastal properties are vulnerable to climate change, they are highly desirable and backed by robust real estate markets. It may be challenging for local governments to create the right market incentives that encourage the removal of development from costly coastal parcels where demand for development is high. Strong coastal management laws that restrict private shore protection structures and regulate the repair of legacy walls may decrease the value of conservation easements and aid in their sale. These types of regulations also signal to coastal property owners that their lands will not be protected, creating an incentive for sending area property holders to engage in TDR programs. Furthermore, coastal properties, particularly in

Hawai'i, have smaller lot sizes from which to sever development rights. TDR credit valuation would need to be adjusted from normal allocation ratios to create meaningful incentives to drive managed retreat. In other words, governments would need to award more TDR credits per parcel than normal development units would allow. Further research in the way of TDR credit valuation is necessary in order for local governments to galvanize support for a TDR program from sending area property owners and receiving area developers.

The price of conservation easements that prohibit shore protection structures (rolling easements) is partly based on the likelihood that a coastal property owner will receive a permit to build a protection structure. Senate bill 2060 raises questions about the feasibility of publicly funded conservation easements. Will conservation easements that ban shore protection structures be of any value when these structures are now prohibited? TDR programs solve this dilemma by shifting the cost of easements into a market setting, allowing easements to maintain value regardless of government restrictions on seawalls. In other words, because governments can establish and regulate TDR credit values based on sending lot sizes—not the feasibility of shore protection structures being built—easements would maintain their value to developers in receiving areas.

In the case of the C&C of Honolulu, there is already high demand among developers to maximize their investments by increasing lot density. Moreover, the City clearly intends to focus development toward Honolulu's Primary Urban Core (PUC) in areas such as Kakaako where there is a focus on Transit Oriented Development (TOD). A TDR program that allows developers within the PUC to increase lot density could drive development away from

sensitive coastal areas and toward a community that is better adapted for SLR. In this sense, a TDR program for the C&C of Honolulu would be a plausible piece in the puzzle of solving managed retreat without placing a burden on the public.

A theme throughout research conducted on managed retreat is the necessity for a retreat catalyst. As discussed previously this catalyst is property devaluation by way of future seawall bans and the phasing out of legacy walls. Literature suggests that a successful TDR program must be able to create the correct market incentives for both TDR sellers and buyers. If legacy seawalls remain it is not likely that owners of lands protected by these walls would be willing to sell TDR credits at a price that would effectively drive managed retreat. Knowing that most of O'ahu's privately owned coastlines are developed, the scope of TDR programs in managed retreat is narrowed without prohibitions on legacy wall repair.

In combination with strong restrictions on private shore protection structures and their repairs, a comprehensive TDR program could substantially assist O'ahu in the managed retreat of already developed coastal lands. In a best case scenario, legacy walls would be allowed to fail, compelling property owners to engage in some form of property abandonment. Over time, as these properties become increasingly prone to the hazards of SLR and decrease in market value, conservation easements will become more appealing. A property owner may be more willing to sell development rights and maintain ownership as the fee simple costs of the property decline. In this case, TDR programs could be highly attractive to property owners. Ultimately TDR programs align with city plans to direct growth towards the PUC and do so with minimal costs to the public.

3.4 REAL ESTATE DISCLOSURES

Federal and state laws require sellers of real estate to disclose certain hazard information (e.g. when properties lie in special flood hazard areas or sit within areas anticipated to experience inundation due to tsunamis) to prospective buyers either before or at the time of transfer (Codiga and Wager, 2011). These disclosure laws are designed to ensure that buyers are fully aware of the conditions of the property, which allows them to make informed decisions about what value properties may hold.

In the context of managed retreat, states can require that real estate disclosures include information on the hazards a property faces due to SLR. Information can include potential hazards due to inundation and coastal erosion, as well as the possibility that parts of the property may revert to state land in the future as shorelines move inland. States can mandate that the disclosure of information takes place during the listing and contracting phases as well as in the recordation of deeds (Codiga and Wager, 2011). Creating SLR hazard disclosures requires that governments have access to erosion maps, future SLR models, and other relevant information and ensure this information is accessible to buyers and sellers.

In Hawai'i, the state requires certain real estate disclosures through HRS § 508D. The legislation mandates that disclosures apply to the re-sale of residential real properties where sellers are required to disclose specific hazards of the property (HRS § 508D-2; HRS § 508D-15). The state requires that sellers of residential properties disclose “material” facts to possible buyers. Material facts are any “fact, defect, or condition, past or present that would

reasonably be expected to measurably affect property value” (HRS § 508D-1). It is logical to infer that coastal property values are affected by both SLR hazards and evolving laws that regulate coastal development and shore protection structures.

In an attempt to require the disclosure of SLR hazards as a material fact, legislators introduced SB 1126 in 2019. The bill proposed that HRS § 508D, be amended to require disclosure notifications when a residential property lies “within a sea level rise exposure area as officially designated by the Hawai‘i Climate Change Mitigation and Adaptation Commission.” More importantly, SB 1126 aimed to amend HRS § 508D to include a SLR hazard exposure statement, executed by the purchaser or transferee. The bill recommended that SLR hazard exposure statements include acknowledgment by the purchaser that:

1. The coastal property is at risk of losing area if the shoreline retreats inland due to erosion, sea level rise, or permitting requirements;
2. Maps showing historic coastal erosion, flood insurance zones, and sea level rise exposure areas exist to inform the public of risks;
3. Shoreline certifications and setbacks are determined pursuant to chapter 205A, and the location of the certified shoreline and setback may be affected by inland migration of the upper reach of the wash of the waves;
4. Obtaining permits to repair or install shoreline protection structures may be difficult due to state and federal coastal zone management policies discouraging coastal hardening;

5. Beaches are public trust resources that governmental agencies have a responsibility to protect;
6. The public enjoys a right of access to Hawai'i's shorelines, including the right of transit along the shorelines, pursuant to section 115-4, and this right of transit can be threatened by shoreline protection structures that reduce the width of beaches as sea level rise occurs; and
7. The department of land and natural resources may require a landowner to remove encroaching vegetation if a landowner's human-induced, enhanced, or unmaintained vegetation interferes with or encroaches on a beach transit corridor pursuant to section 115-10.

These proposed requirements were an attempt to ensure that property buyers are fully aware of the dynamic nature of both shoreline ecosystems and the laws that protect them when purchasing property. A longer-term effect of these conditions would be the gradual decline in the appeal of purchasing coastal properties and an eventual subsidence in market value. The acknowledgement that regulations on shore protection structures are subject to change and that property lines migrate inland with SLR would act as a safeguard for state and county agencies in the event that property owners sue the government.

This bill did not gain legislative approval and was reintroduced in new form as SB 2534 (2020), which excluded recommendations for a SLR exposure statement. The new bill only suggested that HRS §508D be amended to require a disclosure notification when a

residential property lies “within a sea level rise exposure area as officially designated by the Hawai‘i Climate Change Mitigation and Adaptation Commission.” SB 2534 did not gain legislative approval in 2020.

The Hawai‘i Climate Change Mitigation and Adaptation Commission (commission) was created to provide the state with sound, scientific based guidance on future policy pertaining to adaptation to SLR. The commission designated areas susceptible to SLR impacts based on a projected 3.2 foot increase in sea level by the end of the century. These areas are known as sea level rise exposure areas (SLR-XA). Both SB 1126 and SB 2534 were introduced based on the commission’s recommendation to “require mandatory disclosure for private properties and public offerings located in areas with potential exposure to sea level rise. At a minimum the seller shall be required to disclose if the property is located in the SLR-XA as identified in the State’s report” (SB 2534, 2020). Even when containing the minimum recommendation put forth by the commission, SB 2534 was, as mentioned before, unable to garner legislative approval.

Moving forward it is recommended that the Legislature consider implementing the amendments proposed in SB 1126, or at least those in SB 2534. The recommendations are supported by both the State Office of Planning’s 2019 Final Report: *Assessing the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawai‘i* and the University of Hawai‘i Sea Grant Report: *Sea-Level Rise and Coastal Land Use in Hawai‘i: A Policy Tool Kit for State and Local Governments*.

Much like strong setback policy, real estate disclosure of SLR hazards plays a key role in facilitating managed retreat, but over a longer time scale. The effects of disclosures in relation to managed retreat increase temporally as more properties are sold, and more people become aware of the risks in purchasing coastal properties. A second theme throughout research on managed retreat is the need for educating the public on the realities of SLR. Disclosures can act as an educational tool that inform prospective property buyers of the potential for future hazards based on their properties' close proximity to public trust resources. It denies future property owners the ability to render negligence about the material facts characterizing their property. It also aligns with a prevailing theme of managed retreat research: the necessity for property devaluation. Over time, disclosures can lead to a lowering in the market value of coastal properties. While bans on seawalls and legacy seawall repairs can be a direct driver of property devaluation, disclosures can disseminate this information and amplify its impact. When used together, the two policy tools are stronger than in isolation. Likewise, if disclosures and setback policies can create a less than appealing market for coastal property sellers, TDR programs may become more attractive. Mandatory SLR hazard disclosures are recommended as an immediate policy tool that require minimal effort on the part of the government.

3.5 ROLLING EASEMENTS

The term “rolling easement” refers to a vast set of coastal land use policies that allow wetlands and beaches to migrate inland by prohibiting shoreline hardening (e.g. seawalls and roads) and encouraging the removal of structures on the coastline. While an easement generally

refers to the sale of a property right, such as the right to build a seawall or the right to access, not all policies under the umbrella term of rolling easements entail the sale of a property right. For functional purposes, rolling easements are any policy tool that allow coastal lands such as beaches to migrate inland. Generally, a rolling easement is either (1) a regulation prohibiting shoreline protection or (2) a property right ensuring that beaches, wetlands, and access along the shore moves landward with the natural retreat of the shore (Titus, 2011). Figure 2 is a visual representation that depicts a simple division of various rolling easement policy techniques. In figure 2, the “Regulate Protection” box refers to state and county laws prohibiting the construction of seawalls or repair of legacy seawalls, which were discussed in a previous section. The subsections hereafter will explain some, but not all, rolling easement policy techniques in the context of managed retreat.

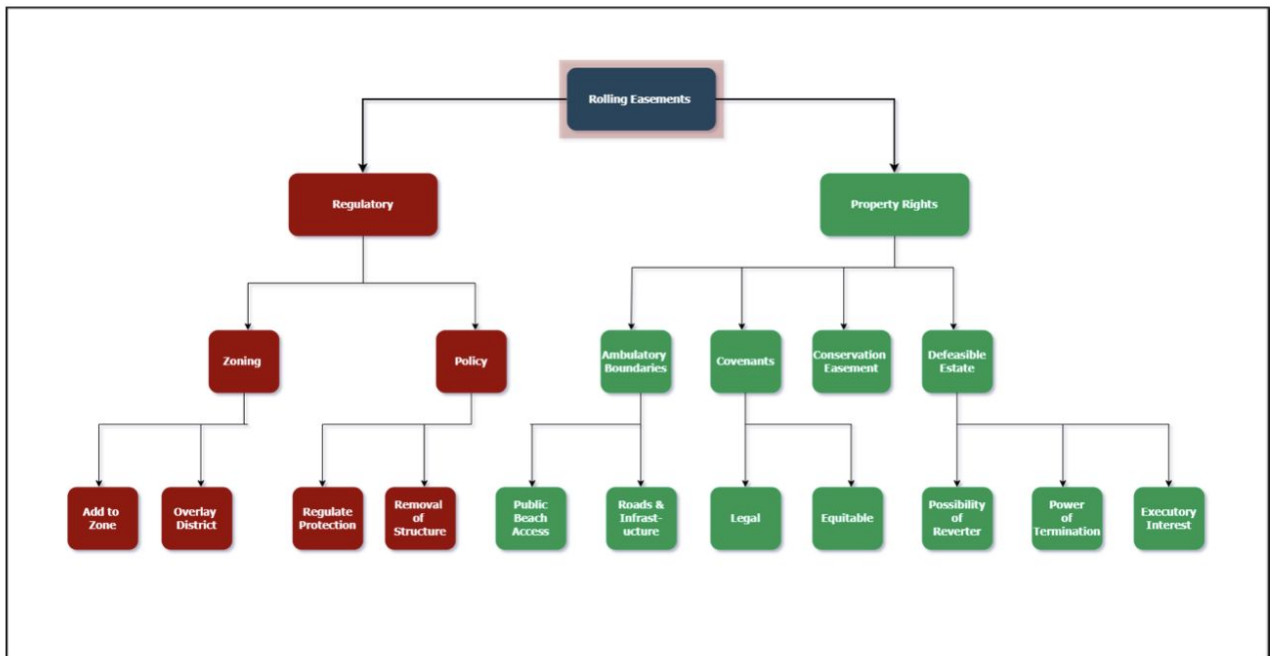


Figure 2) Tree chart of primary rolling easement sections (Regulatory and Property Rights) and rolling easement subsections.

The property rights or “interest in land” approach of rolling easements involves ensuring inland migration of beaches through agreements between landowners and governments or land trusts. Property rights approaches capitalize on the many different ways for an owner of a parcel to transfer some of their ownership rights to someone else. In this sense the approaches under this section are considered easements and are referred to broadly as “recorded rolling easements.” The term “recorded rolling easements” is used by the EPA in its Rolling Easement Primer to refer to any property interest that ensures that shorelines (e.g. beaches or wetlands) are able to move inland (Titus, 2011). Identified as useful to the goals of managed retreat, the following subsections will explain and analyze the concepts of conservation easements and defeasible estates.

a) Shoreline Migration Conservation Easement

Conservation easements are legally binding agreements between governments (or land trusts) and consenting property owners that prevent certain activities deemed harmful to the conservation values of a property. For example, the government can purchase an owner's right to mine or farm if that practice is detrimental to the natural environment. Conservation easements can be an effective tool in protecting land at lower cost to the public while still allowing the property owner to maintain private ownership. A shoreline migration conservation easement (SMCE) is a conservation easement that prohibits shoreline protection structures but does not restrict other dry land uses (e.g. permitted development) (Kreeger et al., 2010). In the U.S., state legislatures can create specific statutes that authorize conservation

easements. These statutes generally specify acceptable easement owners, conservation purpose, and whether or not the agreement is permanent or temporary (Katz, 1986).

In Hawai‘i, the State authorizes conservation easements through HRS § 198 in which an interest in real property is created by deeds, restrictions, covenants, or conditions. The designated purposes of conservation easements are to “preserve and protect land predominantly in its natural, scenic, forested, or open-space condition” and to “preserve and protect the structural integrity and physical appearance of cultural landscapes, resources, and sites which perpetuate indigenous native Hawaiian culture.” HRS § 198 entails that conservation easements are perpetual in duration and holdable by any public body or organization that qualifies for tax exemptions under 501 (c) of the federal Internal Revenue Code (HRS § 198-1-2). Conservation easements may be acquired through purchase, agreement, and donation but not through eminent domain (HRS § 198-3). While there are many examples of conservation easements in Hawai‘i, none of them would currently be considered SMCE. That being said, SMCE would meet the requirements specified under HRS § 198.

In the context of managed retreat, the scope of SMCEs are narrowed to properties that are not currently protected by seawalls and do not confront the problem of legacy walls. However, the large number of unprotected coastal properties threatened by SLR (e.g. Sunset Beach and Punaluu) indicates that SMCE are still a useful tool to consider. While research has indicated that willingness of governments to use taxpayer dollars for such agreements may inhibit their appeal, using TDR programs to purchase SMCE could offer a market-based

solution. As rising seas threaten more unprotected houses fronting sandy shorelines, SMCE used in a TDR setting allow homeowners continued use of their property, while they make critical decisions relating to relocation. The success of any attempt on the part of the government to engage homeowners in easement agreements rests on the ability of governments to garner support from coastal communities. This will be the most critical obstacle to overcome and is a common theme throughout all property right rolling easements. An important part of managed retreat is a good relationship between the implementing party (government) and the residents affected by the interventions (Hino, Field and Mach, 2017). To ensure a smooth transition away from the shoreline it is critical that governments invest in community outreach and education on the topic. While strong coastal regulations like those of SB 2060 may remove the necessity for SMCE, the financial support that SMCE provides can ensure a more orderly transition off of the shoreline.

b) Defeasible Estate and Future Interests In land

“Defeasible estates and future interests in land” (DEFIL) is an umbrella term for a set of rolling easement techniques in which land ownership terminates when a specific physical-triggering event e.g., sea level rises 1 foot, a beach narrows by 1 foot, or the construction of a sea wall) occurs (Titus, 2011). Owners (or buyers) of property normally own land in *fee simple absolute*, which means that ownership lasts forever or until the property is sold. In DEFIL arrangements the land title is split into two periods of time, where the title is transferred to the government (or developer or land trust) upon the occurrence of a specified triggering event. In such an arrangement the owner/buyer of a property owns a *defeasible*

estate while the land trust, developer, or government owns a *future interest*. As explained in more detail later, some DEFIL agreements require the sale of property while others do not. Triggering events such as a rise of 1 foot in sea level are arranged to occur around the same time that a homeowner would predictably have to engage in shore protection. In this way DEFILs meet an underlying goal of managed retreat by allowing the inland migration of beaches. The transfer of land to the government that occurs can ensure the abandonment of that property and removal of structures, and thus satisfies the main goal in managed retreat of vacating the shoreline. This, of course, rests upon the intent of the inheriting party to use the acquired land for conservation purposes. Furthermore, the eventuality of land transfer limits the incentive of owners/buyers to build sea walls because the land will be lost anyways. The following subsections explain and analyze three different ways of dividing land ownership into defeasible estates and future interests.

1) Fee Simple Determinable/ Possibility of Reverter

This DEFIL scenario requires the sale of property in which a developer or land trust grants land to a buyer under the condition that the land will transfer back to the developer when a triggering event happens. In the case of possibility of reverter agreements the triggering events are either specified amounts of sea level rise or coastal erosion from a determined starting year. Conditions of the triggering event are written in the deed, in which a buyer owns a type of defeasible estate called a *fee simple determinable*. The developer (or land trust) holds a *possibility of revert* because the property reverts to the developer upon a triggering event.

Retaining a possibility of reverter is commonly used across the country in cases where land is

provided for rail road (National Wildlife Federation v. ICC, 1988). Owners of farms were often more willing (willing at a lower price) to sell a fee simple determinable, allowing railroads through their land, then selling their land, which “could leave the eventual use unknown and beyond their control” (Titus, 2011). Similarly, a future coastal land seller with concerns about the impacts of rising sea levels may be more willing to sell their land at a lower price if structures will be removed as seas rise to ensure that beaches migrate inland. The seller can choose to donate the possibility of reverter to a land trust or government, in which case the property will revert to that entity upon a trigger condition. Possibility of reverter agreements have a few benefits over shoreline migration easements:

- 1) Holders of the future interests (land trust or governments) do not have to monitor any possible efforts by property owners to extend their ownership through illegal erosion prevention measures because properties will revert regardless. In Hawai‘i private shore protections are already prohibited and thus should not be a source of concern for unprotected properties.
- 2) Holders of future interests do not have to spend money managing the property, which can be expensive in conservation easements.
- 3) Common law has it that anyone can own a possibility of reverter (e.g., community organizations or neighboring property owners). Conversely, only government agencies and qualifying conservation organizations can hold conservation easements.

- 4) In the short term, future SLR is fairly predictable compared to coastal erosion. This allows owners of defeasible estates (where SLR is the triggering event) time to plan and invest in the years before the property reverts to the owner of future interests.

In the context of managed retreat, this technique allows both unprotected and protected coastal properties to be abandoned at minimal cost to the government. In the case that future interests in land are donated to local governments there will be the cost of removing existing structures and monitoring the property for conservation purposes. The success of this technique partly rests upon the government's ability to ensure land owners that they intend to maintain coastal lands purely for conservation use. If coastal property values decline due to the hazards of SLR and stronger coastal managed laws, buyers may prefer to purchase the land at a lower value by acquiring a defeasible estate; sellers may have few other options. Depending on the future market for coastal properties the scope of this technique may be narrowed to "philanthropic" gestures of environmentally conscious property owners.

2) Fee Simple Subject to a Condition Subsequent / Power of termination

This DEFIL scenario referred to as "power of termination" requires the sale of property in which a prospective land buyer purchases a *fee simple subject to a condition subsequent*, and the original land owner (or government/land trust) retains a *power of termination*. A land owner wishing to ensure the migration of beaches inland can choose to donate the power of termination to the government or a land trust. In scenarios concerning power of termination, a buyer owns the property until he/she engages in a specified "triggering" action. In the case of shoreline migration the specified action would be erecting or

repairing a shore protection structure. For all intents and purposes the triggering action in Hawai'i would be the repair of a seawall as the construction of new seawalls is currently prohibited. In general any activity precluded in a shoreline migration conservation easement can also be a triggering event in power of termination agreements. While violating a shoreline migration conservation easement is punishable through monetary means, violating a power of termination agreement ends with land being reverted to the original owner. This DEFIL method holds the same general advantages and constraints in scope as the possibility of reverter method. That being said, courts have been wary of punitive arrangements that cause the forfeiture of land (Nielsen v. Woods (1984) ; U.C.C 2-718 (2001)). Lastly, the method of using power of termination agreements does not require measuring natural phenomena like sea level rise and thus it may be simpler to create and more straightforward with its intent.

3) Fee Simple Subject to a Condition Subsequent/Executory Interest

“Executory Interests” are DEFIL agreements that do not require the sale of land. Here, the original owner of a property retains a *fee simple subject to a condition subsequent* and transfers an *executory interest* to a land trust or government. The transfer of land takes place upon a specified triggering event such as a 1 foot rise in sea level or the erosion of 1 foot of beach. The scope of this technique is likely to be limited to environmentally conscious property owners who wish to ensure that their property does not interfere with the natural beach process. For example, an elderly homeowner with no successors may choose to donate an executory interest to a land trust or government to ensure that after he/she passes, the land is used for conservation purposes.

In general, courts are more inclined to enforce a possibility of reverter than either an executory interest or a power of termination (Boyer, Hovenkamp and Kurtz, 1991). It is also feasible to design a possibility of revert that accomplishes the same goals as both other methods (Vallario, 1999). Because of this, of the three DEFIL scenarios, possibility of reverter arrangements may be the most worthwhile technique to consider. Like TDR programs, DEFIL arrangements offer the benefit of keeping the burden of cost away from taxpayer money. This set of managed retreat policy techniques should be thought of as alternatives to conservation rolling easements and can also be used in tandem.

3.6 MORTGAGE CONTINGENT LOANS

Mortgage contingent loans are a managed retreat policy technique whereby governments offer coastal homeowners low-interest loans to purchase inland properties contingent on the coastal property being relinquished to the government. This type of loan draws upon the idea of the “Higher Education Contribution Scheme”, an income-contingent loan process that is described by Chapman (2006). With income-contingent loans, there are no fixed time schedules for repayment, rather, repayments are proportional to income once a certain earning level is reached. Mortgage-contingent loans are a similar concept, except in the form of an asset contingent loan instead of income-based. A loan of this nature could work through the following mechanisms (Dobes and Chapman, 2011):

- 1) **The property owner yields property title to the government.** As opposed to a buyout program, the government achieves financial savings while reaching the same end goal of acquiring coastal property.
- 2) **The government would either provide a low-interest mortgage loan or act as a guarantor for a commercial loan taken out by the property owner.** The amount of the loan would be capped at a specified proportion to the current value of the property.
- 3) **If the government acts as a guarantor they hold the first mortgage over the new property.** The property owner would be held responsible to maintain the property to a set standard to ensure that the government's assets are preserved in the case that the owner can no longer afford the loan. The government can sell the mortgage into the commercial market to transfer the risk from tax payers to the private sector.
- 4) **The amount of loan available for the purchase of a new property may be reduced based on the costs of demolition and abandonment of the coastal property.**

In 2019 the Hawai'i State legislature failed to pass House Bill (HB) 1564 to establish the "Hawai'i beach preservation revolving fund" to provide low-interest mortgage loans for "qualifying private residential shoreline property (owners) in an expected sea level rise hazard zone or erosion hazard zone." The loans are contingent upon home owners relinquishing shoreline property to the state given that the loan is used "pursuant to HRS § 171-B to acquire

or build a residential property mauka of expected sea level rise and erosion hazard zones.”

Monies for the fund were slated come from:

1. Legislative appropriations fund;
2. An increase in the conveyance tax rate for oceanfront properties with a value of \$10,000,000 or higher from \$1.25 per \$100 of properties sold to \$1.50.
3. Monies received as repayment of loan and interest payments
4. All interest earned or accrued on monies deposited into the fund

A program such as that proposed through HB 1564 could offer financial assistance to homeowners of critically threatened properties enabling them to relocate inland. This form of assistance places less burden on taxpayers than do property buyouts while reaching the same goal. Because the government will re-inherent loan monies and their interest, the scope of a mortgage contingent loan program is broader than both property buyouts and rolling easements. This allows more retreat to occur and more beaches to migrate inland.

Furthermore, as compared with other methods that allow homeowners to maintain ownership of their land (easements and TDR programs), mortgage contingent loan programs enable governments to acquire land and insure that land is used for conservation purposes. The scope of this method may be limited to homeowners whose property is unprotected and in immediate or near immediate danger due to SLR hazards. Property owners whose homes are protected by shoreline protection structures, or aren't imminently threatened by SLR hazardous, may be unwilling to forfeit their coastal properties. The use of mortgage contingent loans may also be limited to owners who own property free and clear. However, governments

can establish mechanisms whereby property owners currently engaged in mortgage payments can continue these payments after property abandonment. The government may also decide to pay off outstanding mortgages, in a pseudo fractional “buyout.”

3.7 LEASING APPROACH

As theorized in *How to Retreat: The Necessary Transition from Buyouts to Leasing* (Young, 2018), the last method of managed retreat method described in this paper is the *leasing approach*. This novel, and currently unpracticed method, is offered as an alternative to the costly and morally hazardous practice of coastal property buyouts. In the case that a property owner decides to abandon a hazard-prone property the leasing approach suggests that the government should rent (not purchase) the land from an owner for a period of time. A lease of this type would have the following features (Young, 2018):

1. **Removal of structure.** The government’s default method should be to offer a lease only for vacant land where all private structures are removed. This is a necessary step if the intention is to allow inland migration of beaches and public access over the leased land. The removal can be assumed directly by the homeowner or by the government where the cost is recovered either directly or through adjustments to the rent. The government should provide early awareness of this default method to disincentivize homeowners who may feel the need to retreat in the future from engaging in more development or shore protection structures.

2. **Prohibiting the potential to rebuild.** The intent should be to keep the land undeveloped to allow the natural retreat of the shoreline. In the case that the shoreline or beach experiences accretion, property owners may attempt to reestablish some development. The lease should serve as a way to preserve that intent when the property owner decides to vacate the land. This intent can be crafted into legislation governing the creation of a leasing program.
3. **Rezoning the land.** As the shoreline migrates inland, throughout Hawai'i, any land makai of the shoreline becomes state conservation land. As the private land mauka of this line loses its utility, it can be rezoned as conservation land. In this way, the loss of utility is the catalyst for rezoning rather than the "change agent that precipitates that decline in utility" (Young, 2018).
4. **Assistance to the land owner.** Leasing the property provides a consistent source of financial support for landowners during a time of financial hardship and adjustment. Young suggests that a lease can be paired with other assistance such as reduced or interest free loans, free financial advising, and tax deductions. Leasing arrangements and supporting packages can be designed to provide an appropriate level of financial assistance.
5. **The end game.** The goal of this approach is not to lease land in perpetuity. Ultimately, the title remains in the hands of the original home owner; the lease will need to be terminated at some point. The intent, rather, is to both revert developed coastal properties to undeveloped public conservation lands and provide homeowners

with financial support in relocation efforts. The lease's termination date will be based on the fulfillment of both goals. Ideally, the lease should not be terminated until the land is guaranteed protection from development in perpetuity. This will occur once public lands move inland through either the movement of the shoreline or the rezoning of dry lands. In the end, the land is vacated, the zoning may have changed, and time has allowed the necessary financial support to retreating homeowners.

In Hawai'i, this approach allows the government to achieve the policy objectives laid out in the state CZMA and local coastal management laws by protecting the longevity and health of sandy shoreline. It offers a solution for the upfront costs of easements and generic buyout programs by spreading out the cost to government overtime. The approach doesn't, however, address moral hazards of using taxpayer money to support private homeowners. It is up to legislators to decide if using public monies to protect public trust lands is an equitable use of funds. The alternatives, which may lead to more beach loss, are arguably less acceptable.

4.0 CONCLUSION

Recent research warns that, under current coastal management policies, 40% of all beaches on O'ahu could be lost by mid-century due to rising sea levels (Tavares et al. , 2020). While beaches naturally migrate inland with SLR, they are lost when confronted with shore protection structures and the houses they protected. A 3.2 foot rise in sea level, possible by 2100, would leave 6,500 homes damaged or destroyed and displace 20,000 residents statewide (Hawai'i State OP, 2019). Shoreline retreat is not only an environmental dilemma but also one

of severe social and economic consequences. Legal opinions and policy directives from the highest ranks of our state and local governments—which acknowledge that SLR is a legitimate threat to beaches and coastal homes alike—suggest that it is time to more effectively protect sandy shorelines as public trust lands. Recent amendments to the state CZM policy show a willingness on the part of elected leaders to make science-based decisions in an effort to protect public trust resources.

The passage of SB 2060 indicates that hardening of the shoreline will no longer be the default coastal management tool. It remains to be seen how homeowners and counties respond to these new regulations. In terms of managed retreat, SB 2060 will force owners of unprotected houses—threatened by the hazards of SLR—to at the very least consider options for retreat. To avoid the resale of this land into the private market for unknown future uses, the government needs to take advantage of this legislative progress to create programs and mechanisms that support homeowners’ retreat. Allowing homes to fall on state lands as erosion occurs—in an effort by regulatory authorities to save money that might otherwise be spent on retreat—should not be the preferred mechanism for managing coastlines. This *laissez-faire* approach is antithetical to the goals of managed retreat: to execute an equitable and *managed* retreat. Instead, state and local governments should engage in efforts to identify a host of representative property scenarios and pair them with appropriate managed retreat policy techniques. Policy approaches should differ based on the urgency of threat, the land’s protection status, the role of the residence as primary or secondary, the homeowner’s financial situation, and the existence of back shore sand deposits, among other criteria.

If HRS § 205a and ROH § 23 aren't amended to prohibit the repair of legacy seawalls, managed retreat techniques are likely limited to unprotected properties. Homeowners of protected residences are likely to reside in their houses as long as their property is sufficiently protected by a seawall. As long as homeowners have the ability to repair legacy seawalls, there is no sufficient financial incentive to abandon the land. As identified earlier, legacy seawalls remain an ongoing threat to the comprehensive approach of beach management. For this reason, lawmakers should prioritize amending HRS § 205a and ROS § 23 in a manner that results in phasing out the continued repair of legacy seawalls.

Financial Assistance for Retreat

We currently advise against fee simple coastal property buyouts as a managed retreat tool, in part because government funding is limited but also because spending public monies on such buyouts would create a safety net assurance and pose moral hazards. There is no intent put forth in state or local HMP to use federal funding for such buyouts. However, property buyouts may become more feasible in the future if federal agencies expand their emergency relief funding to include coastal properties vulnerable—but not yet damaged by—the hazards of SLR.

As a primary recommendation, and a short-term action plan, we recommend the creation of a TDR program by the C&C of Honolulu. For one, counties already have the authority to create TDR programs to “protect the natural, scenic, recreational, and agricultural qualities of open lands including critical resource areas” and to “[e]nhance sites and areas of special character or special historical, cultural, aesthetic, or economic interests or

value” (HRS § 46-161), including beaches. For another, O‘ahu can use the TDR policy framework established by Maui county as guidance. As housing programs that enable the sale of conservation rolling easements, TDR programs transfer the cost of easements to the private sector and thus are not restricted by and to government funding. Unlike status quo rolling easement arrangements, easements sold through TDR programs do not discriminate based on whether a house is protected and maintain the credit value to prospective buyers. In a best-case scenario, legacy walls would be allowed to fail, compelling property owners to engage in some form of property abandonment. As opposed to the *leasing approach* and mortgage contingent loans, TDR programs would offer property owners substantial upfront financial compensation while allowing them to maintain ownership of the property. It is our opinion that of all discussed retreat techniques, TDR programs offer homeowners with maximum financial incentive, comparable to free simple buyouts—all at a minimal cost to taxpayers. Ultimately, TDR programs also align with city plans to direct growth towards the PUC.

While TDR programs offer a market based solution, there may not be enough demand from receiving-area developers to provide funding for all homes needing financial assistance for retreat. To fill this gap we recommend the use of the *leasing approach* as a means of government funded retreat. Notably, this technique is likely limited to unprotected properties, and its future scope and success are highly predicated on restrictions of legacy wall repair. This technique is recommended over mortgage contingent loans for two reasons: 1) The *leasing approach* allows the government to spread financial assistance over time and 2) it provides more incentive to property owners in that they maintain ownership over the land. The

financial mechanisms of the *leasing approach* also appear to be more streamlined avoiding the complication of governments engaging in the lending of taxpayer money.

Lastly, it is recommended that the state and or C&C of Honolulu conduct an extensive study regarding the economic factors that detail these approaches. **It is evident through research that the deciding factor when it comes to choosing mechanisms of financial support for managed retreat is the public.** A study that provides detailed information on the operational costs of such programs will allow government officials to make an informed decision on which technique or combination of techniques is most feasible. Regarding TDR programs, the study should include recommendations on TDR credit valuations and quantify the possible demand on the part of receiving area developers.

Equitable Operationalization of Managed Retreat

Choosing an equitable managed retreat approach that can be used on a broad scope while ensuring objective applicability to shoreline sections of varying geologies, development, and community dynamics is both a goal and a challenge. To operationalize managed retreat, standardized methods of implementation—regardless of the financial mechanism or retreat tool—should be used. While it would benefit government officials and coastal managers to answer the questions of *when* and *where* managed retreat should be used, the answers are often politically sensitive and differ depending on which constituency is asked (e.g., coastal community member vs. conservationist). Because the goal of managed retreat (in the context of this paper) is to protect beaches, we argue that the answers to the above questions should be objective and scientifically based. While the following answers may appear unfair to those

communities most affected, they are indeed equitable given that all shoreline sections are subject to the same criteria.

Where and when. We suggest that government officials prioritize shoreline sections containing backshore sand deposits and dunes for managed retreat to ensure that funds are allocated efficiently and effectively. Retreating houses in such areas will allow eroding beaches to naturally replenish. We also recommend that governments prioritize engagement once a set amount or rate of erosion takes place. Prioritizing areas based on the current amount of beach left and/or erosion rates will allow governments to focus efforts and money on retreating houses closer to the hazards of SLR.

A Hawai'i without beaches is not a Hawai'i that people want to live in or visit for vacation. Absent beaches, our islands' economy, ecosystems, and culture all suffer. The University of Hawai'i at Manoa has provided, and will continue to provide, policymakers with crucial data on coastal erosion and SLR. This body of research should be used for its intended purpose: to protect beaches and inform policy. Statewide, awareness about SLR and the negative impacts of seawalls has reached an unprecedented level. The current social and political environment presents an opportune moment to undertake a comprehensive managed retreat effort. Doing so will ensure a just future for our keiki and those who inherit the changes that we create.

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