ASSESSING THE FEASIBILITY AND IMPLICATIONS OF MANAGED RETREAT STRATEGIES FOR VULNERABLE COASTAL AREAS IN HAWAI'I

Final Report

February 2019

NOAA

Hawaii CZM Program
Coastal Zone Management

SSFM International

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ASSESSING THE FEASIBILITY AND IMPLICATIONS OF MANAGED RETREAT STRATEGIES FOR VULNERABLE COASTAL AREAS IN HAWAIʻI

FINAL REPORT

Commissioned by:

State of Hawaiʻi
Department of Business Economic Development & Tourism
Office of Planning, Coastal Zone Management Program

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This project engaged over 200 stakeholders, including decision makers, government agencies, private industries, researchers and community groups and private citizens involved in coastal zone management. Stakeholders were instrumental in sharing knowledge. The project team would like to thank all those that contributed.

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EXECUTIVE SUMMARY

Managed retreat analysis is a necessary component of climate change adaptation policies. Adaptation, whether through accommodation, such as elevating homes, or protection, such as hardening or beach restoration projects, may not be sufficient and retreat may need to be considered. Managed retreat essentially means shifting development inland from the coast either by the physical movement of structures or changing the restrictions and management of Hawaii's coastal areas. This assessment examines managed retreat programs that have been successfully implemented in post-catastrophic events and in response to chronic coastal hazards and reviews if and how their programs may be applied to Hawai'i. While initially this assessment sought to develop a step-by-step plan to implement managed retreat for areas in Hawai'i threatened by sea level rise and/or other coastal hazards, this objective became an unrealistic and unachievable goal at present, given the various unknowns and competing priorities identified throughout the course of the assessment. The assessment, instead of setting forth serialized actions to take to effectuate managed retreat, makes findings regarding retreat programs and their relative significance to Hawai'i and a specific multi-prong recommendation regarding the feasibility of retreat in Hawai'i.

ABOUT THIS ASSESSMENT

This assessment was commissioned by the State of Hawai'i Office of Planning, Coastal Zone Management Program, pursuant to the *Ocean Resources Management Plan* (2013), and was supported by a consultant team led by SSFM International.

The managed retreat assessment involved four main tasks: 1) Background Research consisting of literature review; 2) development of four Scenario Profiles that are model or representative portraits of areas in Hawai'i needing retreat due to sea level rise and/or other coastal hazards; 3) a Symposium on managed retreat with keynote speakers and expert panelists; and 4) this Final Report, summarizing the results gathered from each prior task.

Chapter 1 of this Report provides background on the policy and planning work that led to this assessment, as well as a definition of managed retreat and key questions that drove the approach to this assessment. It describes the four main tasks and how the findings from one task led to the next. Chapter 1 identifies managed retreat as a "wicked problem" that will need to be approached through a combination of planning, policy, regulatory and financing tools, with critical underpinnings of political will and community acceptance.

Chapter 2 of this Report summarizes findings of the Background Research, i.e., literature review. The Background Research provides examples from United States and around the world of retreat efforts that are completed or underway. Retreat examples are categorized primarily as post-disaster retreat events or retreat due to chronic hazards and there are discussions of how each retreat example relates to Hawai'i.

Chapter 3 of this Report synthesizes the findings of the Scenario Profiles and Symposium. The Scenario Profiles offered sample, model or representative development types for retreat based on four types of development: single family homes; resorts, hotels and condominiums; urban areas; and critical infrastructure. The information gathered from the Scenario Profiles for each development type are contained in Chapter 3.

The Managed Retreat Symposium provided further opportunity to explore the findings from the Background Report and Scenario Profiles before a statewide audience. 100 attendees from the public and private sectors attended the all-day event hosted by the State Office of Planning, Coastal Zone Management Program on January 11, 2018. Information and perspectives were shared by two keynote speakers from the U.S. mainland with experience implementing two forms of managed retreat – retreat after a catastrophic event and retreat from chronic coastal hazards. The first was from the State of New Jersey who managed the New Jersey Blue Acres Buyout Program after Superstorm Sandy, and the second was from the Ventura, California Surfrider Foundation, which championed relocation of a coastal parking lot and bike path deemed necessary because of chronic coastal erosion. The balance of the Symposium involved four panels with Hawai‘i experts in the following topic areas: Finance/Tax/Economics; Legal/Policy; Insurance; and Open Space/Public Access/Social Justice. The frank and lively discussion that occurred between panelists and participants underscored a number of challenges and perceptions that would need to be navigated in implementing managed retreat, confirming that it is indeed a complex matter to implement, requiring ample time, funding, cooperation and creativity.

Chapter 4 of this Report presents several findings, in response to the key questions in Chapter 1, drawn from the Background Research, Scenario Profiles and Symposium. This Report also makes one major recommendation with several components. This Report recognizes that retreat is not a simple task which may be easily accomplished, despite the urgency of the situation. There needs to be additional review and consideration of the factors – land use, planning, legal, financial, etc. – implicated by retreat, which this Report, being an initial assessment of whether retreat is even feasible or not, does not have the ability and/or capacity to address.

Acronyms and Abbreviations

A

ACT Appropriate Coastal Development and Management of Coastal Hazards Action Team

C

CRS Community Rating System
CZM Coastal Zone Management

D

DLNR Department of Land and Natural Resources

F

FEMA Federal Emergency Management Agency
FIRM Flood Insurance Rate Maps

H

HDOT Hawai‘i Department of Transportation
HMGP Hazard Mitigation Grant Program
HRS Hawai‘i Revised Statutes
HUD U.S. Department of Housing and Urban Development

I

IPCC Intergovernmental Panel on Climate Change

L

LA SAFE Louisiana Strategic Adaptations for Future Environment

N

NFIP National Flood Insurance Program
NOAA National Oceanic Atmospheric Administration
NPR National Public Radio

O

OCCL Department of Land and Natural Resources, Office of Conservation and Coastal Lands
OP Office of Planning
ORMP Ocean Resources Management Plan

S

SLR Sea level rise
SLR-XA Sea level rise exposure area
SMA Special management area
STAC Sea Level Rise Technical Advisory Committee

T

TDR Transfer of development rights

U

UH University of Hawai‘i

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CHAPTER 1: MANAGED RETREAT PROJECT INTRODUCTION

This Report is the culmination of a project to "Assess the Feasibility and Implications of Managed Retreat Strategies for Vulnerable Coastal Areas in Hawai'i" (hereinafter, "Project").

To begin assessing managed retreat strategies, a common definition of managed retreat was first decided upon. The Project uses Esteves's definition of managed retreat (2014). The Project also used NOAA's implementation understanding of managed retreat to set the assessment parameters. According to the National Oceanic and Atmospheric Administration (NOAA) (2007), "managed retreat typically involves establishing thresholds to trigger the demolition or relocation of structures threatened by coastal hazards or sea level rise. This approach is frequently coupled with several other planning and regulatory techniques including: shoreline planning, to identify high-risk areas where this type of policy would be the only cost-effective, long-term solution; regulating the type of structure allowed near the shore to ensure that buildings are small enough and constructed in a way to facilitate relocation when needed; and instituting relocation assistance and/or buy-back programs to help with relocation costs or compensate property owners when their property becomes unusable."

> *'Managed' refers to the purposeful actions and plans to implement and monitor projects; and 'Retreat' or 'realignment' refers to the reposition of the shoreline.*
>
> *~ L.S. Esteves (2014)*

Both Esteves's definition of and NOAA's implementation framework for managed retreat apply equally to catastrophic and chronic events, which may occur and are occurring in Hawai'i. In the context of this Final Report and Project, catastrophic events are natural disasters, e.g., Super Storm Sandy, Hurricane Katrina, the 1960 Hilo Tsunami, etc. Chronic hazards are those that involve periodic flooding, wave inundation, coastal erosion, etc. These catastrophic and chronic hazard events may give rise to the consideration of managed retreat as an adaptation strategy, as accommodation (e.g., elevating homes) and protection (e.g., installing seawalls or beach restoration) may not always be successful in mitigating and/or ameliorating the harms.

The Report is a synthesis of the information gathered during the Project. The Report is not a plan or framework for the implementation of managed retreat in Hawai'i but examines whether managed retreat may be feasible based on the information learned and research gathered. The Report also makes certain findings and recommendations regarding managed retreat to develop a viable managed retreat strategy.

A. PROJECT ORIGIN AND ORGANIZATIONAL SETTING

The Project was commissioned by the State Office of Planning, Coastal Zone Management (CZM) Program. It was conducted by SSFM International with a team of subject matter experts. Work on the Project began in February 2017 and was completed in June 2018. Funding for the Project came from the NOAA Office for Coastal Management.

The three specific tasks undertaken during the Project, in addition to this Report, include: Background Research; four Hawai'i specific Scenario Profiles; and a managed retreat Symposium.

- Background Research was conducted mainly through literature review. Managed retreat activities, programs and policies from Hawai'i, nationally and internationally were studied. Background Research is more specifically detailed in Chapter 2. Overarching themes extrapolated from the Background Research were used to guide discussions for Hawai'i Scenario Profiles.
- Four Scenario Profiles explored how the overarching themes extrapolated from the Background Research would apply if managed retreat is to be conducted in Hawai'i in certain settings. For Hawai'i Island, the managed retreat Scenario Profile case setting was single-family homes. Maui was the managed retreat Scenario Profile case setting for resorts, hotels and condominiums. Kaua'i was the managed retreat Scenario Profile case setting for urban areas. O'ahu was the managed retreat Scenario Profile case setting for critical infrastructure. The Scenario Profile case setting for a representative single-family home area, resort, hotel and condominium area, urban area or critical infrastructure area does not represent a specific place or locale, but instead is a sample, model or representative portrait of a location that is along the coastal area in Hawai'i and may be considering retreat due to sea level rise and/or other coastal hazards. As part of generating a comprehensive Scenario Profile case setting portfolio, a field visit with local officials on each island was conducted. A focus group discussion was held with stakeholders for each representative Scenario Profile. A summary for each Scenario Profile is contained in Chapter 3. Information derived from the Scenario Profiles generated the Symposium panels.

Image: Kaua'i site visit (Credit: Abbey Seitz).

- Symposium. An all-day Symposium was held January 11, 2018 at Aloha Tower Marketplace in Honolulu. There were two keynote speakers from the continental USA with experience in implementing managed retreat. Fawn McGee, Director of the New Jersey Department of Environmental Protection, Blue Acres Buyout Program, and Bureau Chief, New Jersey State Land Acquisition, managed a voluntary buyout program to facilitate managed retreat, resulting from a catastrophic event (Superstorm Sandy). Stefanie Sekich-Quinn, Coastal Preservation Manager, Ventura Surfrider Foundation, described her organization's successful championing of the managed retreat of a coastal parking lot and bike path, deteriorating from chronic coastal erosion. Local speakers served on four panels: (1) Finance, Tax and Economics; (2) Insurance; (3) Legal and Policy; and (4) Open Space, Public Access, and Social Justice. These four panels were derived from themes universal to the four Scenario Profiles. Active involvement came through questions posed by over 100 attendees made up of persons from the fields of insurance, development, construction, finance and government agencies. The Symposium synopsis is in Chapter 3 and videos of the Symposium sessions may be found on the CZM website, http://planning.hawaii.gov/czm.

- Final Report. This Final Report synthesizes the results of all work and input received from the Background Research, Scenario Profiles and Symposium. A suggested approach for further managed retreat exploration in Hawai'i is presented in Chapter 4.

While initially the Project considered formulating a step-by-step plan for managed retreat, this was ultimately decided to be an unrealistic and unachievable goal at present, given the various unknowns and competing priorities identified throughout the course of the Project. There is not a one-size-fit-all solution to managed retreat. For example, single family homes have different retreat criteria than condominiums and those have different retreat criteria than critical infrastructure.

Hawaii's CZM Program undertook assessing the feasibility of managed retreat in Hawai'i pursuant to its programmatic purview. Hawaii's CZM program was approved in 1977 (Chapter 205A, Hawai'i Revised Statutes) as part of the Federal CZM program, which was created in 1972. This federal-state partnership provides a basis for protecting, restoring and responsibly developing important and diverse coastal communities and resources. Hawai'i CZM is the resource management umbrella to provide guiding perspectives for land and water uses and activities throughout the State and counties. The Hawai'i CZM area encompasses the entire State because there is no point of land more than 30 miles from the ocean. What occurs on the land and in the mountains impacts the coastal waters and marine resources.

The CZM Program work includes "regulatory and non-regulatory techniques to address coastal issues and uphold environmental law. Among these are stewardship, planning, permitting, education and outreach, technical assistance to local governments and permit applicants, policy development and implementation, and identification of emerging issues and exploration of solutions" (http://planning.hawaii.gov/czm/about-czm/, 2018).

The CZM program is also mandated by Hawaii Revised Statutes (HRS) Chapter 205A to coordinate the implementation of the Ocean Resources Management Plan (ORMP). The 2013 ORMP identified eleven Management Priorities (MP). Managed retreat is pertinent to at least two MPs: MP #1, Appropriate Coastal Development, and MP #2, Management of Coastal Hazards.

The Action Team for Appropriate Coastal Development & Management of Coastal Hazards formed to further address MP #1 and MP #2. The membership of the Action Team consists of federal, state and county partners. The Action Team expanded upon the goals in the 2013 ORMP through the creation of an *Implementation Plan (2013-2018).* The Implementation Plan's consideration of options to retreat threatened development from coastal hazards led to the creation of this Project. The Action Team was informed of progress throughout the Project, and individual members were consulted at key points during the Project, including the Scenario Profiles.

> Expand efforts to assess the feasibility of implementing managed retreat strategies (e.g., shoreline armoring restrictions, rebuilding restrictions, structure removal requirements, acquisition and buyout programs, conservation easements, rolling easements, etc.) to gradually shift threatened development inland and away from vulnerable coastal areas.
>
> ~ Action Team for Appropriate Coastal Development & Management of Coastal Hazards *Implementation Plan (2013-2018)*, Management Priority 1, Goal C, Metric 6

B. Policy and Research Setting for Climate Change Adaptation

Hawai'i has long recognized that climate change is real and must be addressed. The State has adopted climate change policies, such as: (1) establishing a *Framework for Climate Change Adaptation in Hawai'i* (2009) under the State of Hawai'i Office of Planning Coastal Zone Management Program; (2) enacting HRS § 226-109 Climate Change Adaptation Priority Guidelines; and (3) creating the Hawai'i Climate Change Mitigation and Adaptation Commission (Climate Commission) under HRS Chapter 225P.

Several reports and studies have been conducted in Hawai'i, assessing the ramifications of climate change and sea level rise in Hawai'i. In 2011, University of Hawai'i Sea Grant College Program issued a report called *"Sea-Level Rise and Coastal Land Use in Hawai'i: A Policy Tool Kit for State and Local Governments."* Referred to as the "Tool Kit," it addresses over a dozen regulatory tools, four spending tools and three market-based tools for adaptation.

Shortly before the Symposium for this Project was held, a landmark report was released by the Climate Commission entitled *Hawai'i Sea Level Rise Vulnerability and Adaptation Report* (Climate Commission, 2017). It estimates that 3.2 feet of sea level rise would render over 25,800 acres of land in the state unusable and would affect over 6,500 structures and displace more than 20,000 residents. The present value of the impacted structures and land amounts to over $19 billion. Planners and others are urged to consider the 3.2 feet metric as something that can occur in the near term. The same report also demonstrates an increased risk of coastal flooding from catastrophic events such as hurricanes and tropical cyclones (Climate Commission, 2017).

The 3.2 feet figure derives from the work of the United Nations Intergovernmental Panel on Climate Change (IPCC) in 2014 predicting this level of sea level rise by the year 2100. Recent studies by Le Bars, Drijfhout and deVries, 2017, and by Sweet, et.al, 2017 indicate the effects from sea level rise may be greater than 6 feet as a "physically plausible" event by the end of the century.

This Report on the Project joins the growing body of literature on climate change impacts in Hawai'i and examines the feasibility of a specific adaptation strategy, i.e., managed retreat.

Climate Change Main Adaptation Strategies:

- Accommodation involves adapting existing structures and systems to allow them to better withstand changing conditions. Examples include: flood-proofing, moving critical equipment above flood elevations or elevating structures to provide flood clearance.

- Protection protects an area or a system in its existing location to withstand impacts from changing conditions. Protection includes shoreline hardening, such as seawalls and revetments, and soft protection methods, such as beach restoration.

- Managed Retreat involves relocating existing structures out of the vulnerable area and avoiding new development there.

~ Codiga & Wager, 2011

C. What are Adaptation Options?

Retreat is one of three main adaptation approaches to sea level rise and other coastal hazards. The other two are accommodation and protection. Accommodation involves adapting existing structures and systems to allow them to better withstand changing conditions. An

example of accommodation is elevating a structure on piles to greater tolerate more extreme wave inundation.

Protection strategies include both hard and soft solutions. Hard methods of protection safeguard an area or a system in its existing location to withstand impacts from changing conditions. Examples of hard protection include seawalls, rock revetments and other hard structures to hold back the advance of the sea.

Beach nourishment is an example of a soft protection solution. Sand is collected from some other source and spread onto the beach to widen it. This has been done in Waikīkī several times. Some of the possible negative consequences of beach nourishment may be changes to the ocean bottom and wave quality, as well as costs associated with ongoing maintenance.

Both accommodation and protection, regardless of hard or soft, require ongoing maintenance and may eventually fail and need to be repaired. As such, they may only be temporary solutions. Further, seawalls – a hardened protection method – are becoming more and more disfavored due to their potential negative effects on neighboring beaches and properties. Seawalls may eventually result in the erosion of many adjacent beaches, which in turn will affect critical wildlife habitat and highly valued recreational sites, having cultural and other value for residents and visitors.

The above descriptions of accommodation and protection are brief and general to give a broad introduction to the two concepts. The descriptions of accommodation and protection were not meant to thoroughly discuss and analyze each as an adaptation strategy for coastal hazards.

D. Managed Retreat as a Complex or "Wicked" Issue

Planning and public policy analysts classify highly complex issues with incomplete, contradictory and socially conflicting perspectives as "wicked." The term was introduced by Horst Rittel and Melvin Webber in a 1973 paper where they defined ten characteristics of a wicked problem.

Wicked problems are viewed as resistant to resolution; there is no right or wrong; they cannot be solved in a traditional manner using a sequence of definition/analysis/solution.

Kelly Levin, Benjamin Cashore, Graeme Auld and Steven Bernstein introduced the term "super wicked problems" in a

Characteristics of "Wicked Problems" (Rittel & Webber, 1973)

- There is no definitive formulation.
- They have no stopping rule.
- Solutions are not true or false but better or worse.
- There is no immediate and no ultimate test of a solution.
- Every solution is a "one-shot" operation. There is no opportunity to learn through trial and error. Every attempt counts.
- There is no exhaustive list of solutions.
- Every wicked problem is essentially unique.
- Every wicked problem is a symptom of another problem.
- The choice of explanation of the problem determines the resolution and vice versa.
- The planner has no right to be wrong and is responsible for the consequences.

Added Characteristics of "Super Wicked Problems" (Levin, Cashore, Auld & Bernstein, 2009)

- Time is running out.
- No central authority.
- Those seeking to solve the problem are also causing it.
- Policies discount the future irrationally.

2009 conference paper and later in a 2012 journal article in *Policy Sciences*. Their reference was global climate change which they define as "super wicked" because the agent involved in solving the problem (i.e., nations) is also the cause of the problem.

Contributions from the speakers at the Symposium conducted for this Project confirm that for Hawai'i, climate change adaptation is indeed a wicked problem.

Managed retreat as a potential response (which is differentiated from the cause) to climate change, sea level rise and chronic coastal hazards can likewise be labelled as wicked. Hawaii's stakeholders have different views of managed retreat. This, along with ideological and political differences and fiscal constraints, leads to struggles in formulating or implementing a clear policy or program. An illustration of this is that Hawaii's tourism industry, housing stock, critical infrastructure and public facilities are mostly concentrated along the coast. Panelists and attendees at the Symposium asked: Where could they retreat to? Would there ever be enough money to do so, either in the private world or with public subsidy? Who pays and who benefits? Is this an individual or a collective issue?

Attempting to find agreement on a wicked problem among conflicting stakeholders is directly pertinent to any consideration of the feasibility of managed retreat. The Scenario Profiles in this Project show that planners are often the ones who must inform others about the importance of coastal protection and at the same time enforce it through land use, permitting and zoning decisions. Planners exercise both ministerial actions and discretionary functions. Where policy is clear such as through legislation, inclusion in a budget or case law, this helps with implementation. But in situations where there are technical uncertainties, other factors arise, such as political opposition and a polarized community's sense of what is fair and "pono" (right). Determining feasibility of a strategy for managed retreat must deal with this complexity.

The synthesis of the Background Research, Scenario Profiles and Symposium presentations are an effort to help articulate and navigate through the perspectives as they present themselves at this time. While the Project engaged over 200 stakeholders, it cannot be considered fully representative of all the agencies, industries, community groups and individuals that would be involved in any potential managed retreat program. For this reason, the scope of this Project is to begin to identify factors, issues and concerns in a variety of development settings. The findings are intended to inform further discussions.

E. WHAT IS MEANT BY FEASIBILITY?

This Project is a feasibility review of managed retreat as an adaptation strategy to climate change, sea level rise and other coastal hazards. Feasibility is presented in objective and neutral terms. The information of most importance is lessons learned, or in the instance of this Project, how various managed retreat scenarios would be or could be applied to Hawai'i. The predominant approach used in this Project is to identify resource materials, summarize the salient points and assess the applicability in Hawai'i for each of the three basic units of research: Background Research, Scenario Profiles and Symposium. Where examples are shown from the literature review, the description shows: reason or need for the program, magnitude of those affected, program sponsor, funding source and level and results.

F. KEY QUESTIONS FOR MANAGED RETREAT

This Project, at the outset, raised certain questions regarding the feasibility of managed retreat in Hawai'i, once retreat is determined to be pursued as the policy objective in conjunction with accommodation and protection:

- What criteria should be used to determine when retreat is the solution as compared to accommodation or protection? These factors may be different depending on areas to be retreated, e.g., critical infrastructure versus private property.
- What are the priorities for retreat? Should critical infrastructure, such as water facilities, waste water facilities, hospitals, etc., be preserved first or legacy beaches (meaning beaches with significant historical and cultural significance, such as Sunset Beach on Oahu's North Shore) for tourism or rights of private property owners?
- What are the monetary costs for retreat and tax implications of retreat? This may be a factor mitigating against or for retreat as compared to accommodation or protection.
- What are the available lands by State and county land use to retreat to?
- Who should be responsible for shouldering the financial burden of retreat? Is it the private or public sector or a combination?
- What are the myriad of legal issues surrounding retreat – rebuilding restrictions, structure removal requirements, acquisition and buyout programs, conservation easements, rolling easements, etc. – to be addressed?

With these key questions in mind, the Project commenced with Background Research into managed retreat.

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CHAPTER 2: SYNTHESIS OF BACKGROUND RESEARCH ON MANAGED RETREAT

Background Research involved extensive literature review on managed retreat.

There is an enormous and ever-growing body of literature on the scientific measures of climate change, including excellent maps of vulnerable areas in Hawai'i and across the globe. These are captured in other studies and will not be repeated here. Rather, the purpose of this Project is to report on managed retreat, its feasibility and what makes it successful or not. It starts to address questions of what resources are required for managed retreat and under what circumstances.

A. Overall Review of Managed Retreat Implementation

A 2017 study by Miyuki Hino, Christopher B. Field and Katharine J. Mach of Stanford University published in *Nature Climate Change* (Vol. 7 May 2017) identified and examined 27 recent cases of managed retreat in 22 countries that resettled approximately 1.3 million people over the past three decades. It includes both pre- and post-disaster cases and both single interventions and wider programs. The Hino study is significant due to its size and worldwide reach. However, as the authors note, it "pales in comparison to this century's projected displacements" (Hino et. al, 2017).

Managed retreat in the Hino study is claimed to derive from coastal engineering and is defined as the "application of coastal zone management and mitigation tools designed to move existing and planned development out of the path of eroding coastlines and coastal hazards." Two features are flagged as defining: that it is a deliberate intervention intended to manage natural hazard risk; and that it involves abandonment of land or relocation of assets. Hino's definition of managed retreat aligns with the Project's definition of and implementation framework for managed retreat found on page 1 of this Final Report.

Hino et. al. (2017) explained several reasons why decision-makers shy away from political contention and why managed retreat is not used more often:

- It is controversial because of the social and psychological difficulties in displacing people from their homes, the "central reference point of the human existence."
- Attachment to place, perceptions of the potential destination and economic prospects shape attitudes toward managed retreat.
- Managed retreat is not a low-regrets option and it is not easily reversed.
- Intangible costs such as cultural-heritage loss can be high.
- "Levee effect" where once structural protection is provided, development increases behind it, amplifying motivation to continue, and leading to legal challenges if maintenance of defenses ceases.
- Benefits accrue to others than those who are moved.

An argument in favor of managed retreat, Hino states, is that retreat, once implemented, has lower costs than engineering hardening, while permanently reducing the natural hazard risk.

Hino et. al. (2017), see graphic below, examined clusters of interventions to determine if there were explanations for why and when programs were created. Their conclusion is that the most fundamental factor is the relationship and interactions of the parties involved. Four categories of relationship reflect degrees to which residents initiate the move and whether only residents benefit or society benefits and are shown in an axis diagram with four quadrants shown on Figure 1 below.

- Post-disaster voluntary relocation programs typically fall in the Mutual Agreement quadrant (upper right). Once seeing the results that their community is changing, initially hesitant owners may gravitate into the program. Typically, regulations and permit obstacles are more readily overcome. The New Jersey Blue Acres Buyout Program case presented at the Symposium and in Chapter 4 this report is a good example of Mutual Agreement.
- Greater Good quadrant (upper left) cases are driven by a motivated implementing party which often must overcome resident opposition through incentives or mandates.

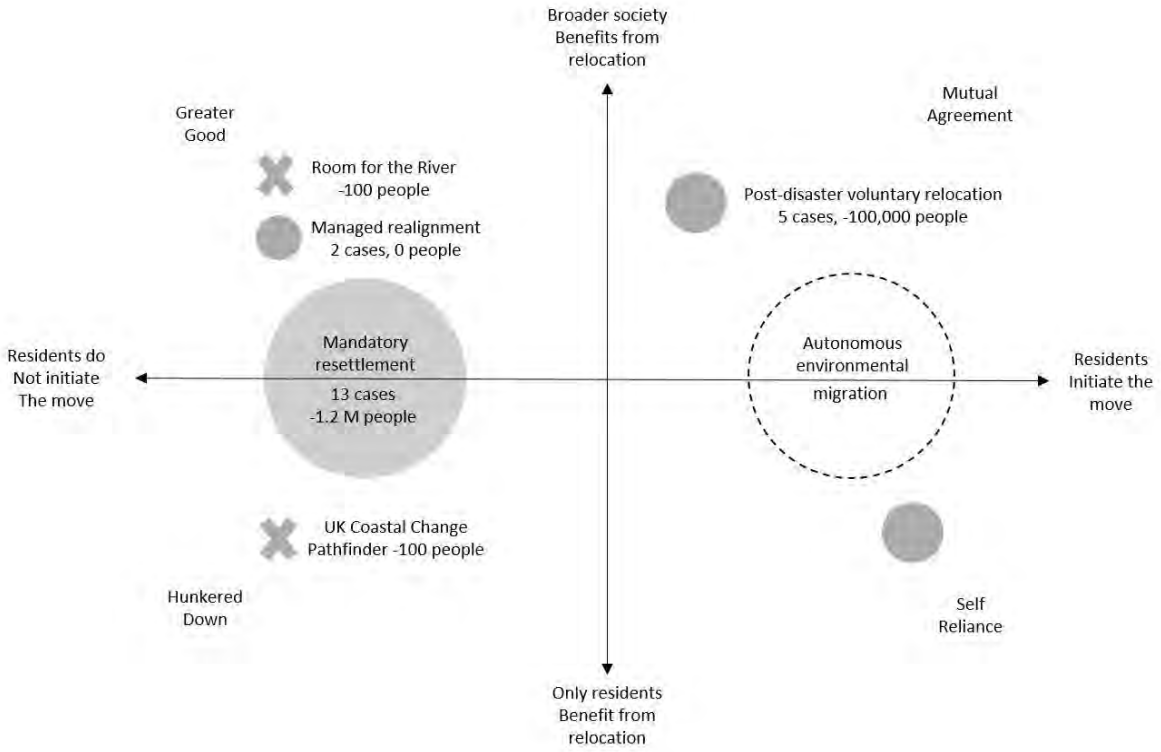

Figure 1: Relationship Diagram of Managed Retreat Programs and Stakeholders. (Credit: Hino, Field, Mach. "Managed Retreat as a response to natural hazard risk." Nature Climate Change 7 (2017))

- Hunkered Down (lower left) occurs when residents resist, and relocation is implemented through political will and authority. Over half of the cases fell in this category and they typically came as a government reaction to a major disaster (e.g., Sri Lanka post 2004 tsunami).
- Self-reliance quadrant (lower right) comes about when residents try to persuade an implementing authority to support relocation. The examples cited are the Alaskan villages of Newtok, Shishmaref; Kivalina; the Pacific Island country of Kiribati which sought migration through bilateral agreement with other nations; and Isle de Jean Charles in Louisiana. These cases have so far been initiated by native peoples and have involved long struggles that are frequently without success. People move or migrate on their own out of necessity.

Note: The bullet symbols (•) after each Applicability to Hawai'i statement are to provide analysis, reasoning and thought as to how the managed retreat actions described may be transferred to Hawai'i.

The (⚠) symbols after each Applicability to Hawai'i statement are to provide analysis, reasoning and indicate further thought as to how the managed retreat actions described may not be suitable to Hawai'i or require further research to determine transferability to Hawai'i.

Applicability to Hawai'i: There are several implications from Hino et. al.'s research that are relevant for the feasibility of managed retreat in Hawai'i.

- When actual and perceived risks rise, there is a greater chance for support for managed retreat from the public and implementing entities.
- Post-catastrophic disaster periods offer the most realistic settings for a Mutual Agreement outcome.
- Regulations that limit rebuilding can facilitate retreat.
  - ⚠ However, State and counties must be cognizant of entities with established entitlement or property rights, which may trigger litigation. Therefore, State and county planning frameworks and building codes, recognizing managed retreat as a potential adaptation option, must be adopted, if managed retreat is to be a viable option.
- For programs driven by Greater Good, incentives and opportunities for places to move *to* (versus *from*) will be necessary.
  - ⚠ However, the issues are again the costs of relocation and who is responsible for bearing the costs. As for available lands to retreat to, State and county must have land use policies supporting managed retreat as a potential adaptation option and

must adopt planning frameworks supportive of managed retreat, if retreat is to be a viable option. Hawai'i State Land Use establishes an overall framework of land management and where land may be beneficially developed, i.e., populations and infrastructure may be relocated, if necessary. Counties have land use authority, conforming to the Hawai'i State Land Use framework, through their subdivision and zoning authority.

- To support retreat, opportunities for communities to stay together are desirable. In many instances, decisions by residents whether to participate are most frequently influenced by what their neighbors are doing (Hino et. al., 2017).

B. Place-Based Specific Examples of Managed Retreat in the Literature

Examples of Chronic Coastal Hazards Leading to Managed Retreat Actions

Relocations have been occurring around the world. One case often cited is the United Kingdom Medmerry Managed Realignment along the south coast of West Sussex. This involved reclaiming three farms to form a saltwater marsh (Foster, 2014). In the Netherlands, an example is the farming community of Noordwaard, which experienced repeated flooding. Seventy-five households were moved, protective dikes lowered and the land allowed to flood. In Queensland, Australia more than 250 people in Lockyer Valley were provided State and national assistance to move away from their repeatedly flooding homes. In Guatemala, hundreds were moved when Hurricane Stan (2005) flooded their homes to the point of irreversible damage (Nijhuis, 2017).

Two nations have had to plan for full retreat due to sea level rise: Kiribati and Maldives.

Applicability to Hawai'i: For Hawai'i, international retreat models are instructive for social and psychological factors.

- Knowledge of how foreign nations have implemented managed retreat is important and should be studied as, per Hino et. al., 2017, social and psychological factors are crucial to designing a viable retreat program.
  - ⚠ While internationally there are examples of managed retreat, they may not be easily analogized to Hawai'i. The land use, legal framework and planning structure of Hawai'i will impact managed retreat analysis and are different from the various international settings.

In the U.S. three full retreat examples were found of tribal nations retreating: Isle de Jean Charles, Quileute Tribe in Washington; Shishmaref Island in Alaska; and Tahoolah, Quinault Indian Nation in Washington (Nijhuis, 2017). The case of Isle de Jean Charles is described below.

> Isle de Jean Charles, Louisiana. Isle de Jean Charles is an island located in the Mississippi River in Louisiana. It has been hit by many storms which,

coupled with sea level rise, subsidence and erosion, resulted in its land area being reduced by 98% since 1955. Only 320 acres remain and all of that is subject to future flooding. Most residents are members of the Biloxi-Chitimach-Choctaw tribe. In 2017 they received a $48 million federal grant to relocate their community to the City of Houma. This appears to be the first U.S. example of federal funds being used to help a group of people abandon their homes and relocate to another place. Federal officials hope this will serve as a model for other relocations along the Louisiana coast (Nijhuis, 2017).

***Applicability to Hawai'i*:** The Isle de Jean Charles, Louisiana managed retreat situation is illustrative of how Hawai'i must proactively long-range plan for the severe consequences of climate change and sea level rise.

- Hawai'i will have to undertake long-range planning to address the detrimental effects of climate change, sea level rise and coastal erosion. Long-range planning for managed retreat, in addition to accommodation and protection where appropriate, includes reviewing State and county land use to determine where Hawaii's populations and necessary infrastructure may be relocated.
  - ⚠ The Isle de Jean Charles situation involves tribes, which may not easily be transferable to Hawai'i, given that the U.S. has a unique legal relationship with and obligation to tribal nations.

Examples of Catastrophic Events Leading to Managed Retreat Actions

This section describes programs for managed retreat resulting from catastrophic events. Even though the managed retreat is the result of post-disaster situations, an implementation plan still must be developed and communicated to affected persons, which usually has to be done in a short time frame. If a program were already established and ready to implement, it could shorten some of the time constraints and avoid many potential stumbling blocks.

Hilo, Hawai'i. One need look no farther than home to find an excellent example of post-disaster retreat: Hilo, Hawai'i after the 1960 tsunami. The County decided that a portion of the inundated area of downtown Hilo was not appropriate for future development due to the ongoing risk of hazards. The Urban Renewal Plan for the Kaikoo Project (1965) designated "elevated areas" and "open spaces" of the project area to have limited commercial and industrial spaces, with the rest of the area to have mostly open spaces. The plan forbade any residential uses to be permitted. Using federal disaster recovery funding, all real property in the area was acquired at fair market value by the Hawai'i Redevelopment Agency. The plan is silent on where displaced people and uses would retreat to (Hawai'i Redevelopment Agency, 1965).

***Applicability to Hawai'i*:** It is instructive to review the 1960s Hilo managed retreat framework for open space considerations, which are critical to retreat planning.

- Open space is a vital aspect of managed retreat planning, as shown by the Kaikoo managed retreat project. Open space is necessary for creating a buffer against future storms.
  - ⚠ While the Kaikoo managed retreat project was enormously successful, it occurred during the 1960s, which was a vastly different legal and bureaucratic time than now.
  - ⚠ While laws may be suspended during a disaster declaration, they are only temporarily suspended. Thus, it may be difficult to relocate large communities, given present day scale, while still comporting with present legal requirements.
- Purchasing of property at fair market value is necessary to incentivize retreat.
  - ⚠ However, in present day market values, the relocation of entire communities will be extremely costly in Hawai'i, given our high real estate prices. Therefore, cost may be a mitigating consideration. The median single-family home prices on O'ahu was $810,000 in August 2018 (HNN, 2018).
  - ⚠ Additionally, the population size of Hawai'i is much larger now than in 1960. Therefore, it will be more difficult to find suitable developable lands (with the proper land use classification, zoning, infrastructure, etc. to support retreating population, etc.) to relocate large communities versus single families.

Puna, Hawai'i. Hawai'i County is currently faced with another catastrophic event, but with a different cause. Lava flowing from the Kīlauea volcano has covered over 6,000 acres in lower Puna, destroyed 700 plus homes, as well as roads, crops and people's livelihoods (HNN, 2018). Concurrently while dealing with immediate evacuation needs, the County and State are also grappling with where displaced people can be sheltered and homes built because there are no homes to return to. Government support is essential to provide land, expedited permitting, coordinated donations of labor and materials and other housing development support. The struggle to find financial resources for this continues as this report is being written in June, July and August of 2018.

***Applicability to Hawai'i*:** While Kīlauea volcano is not dealing with sea level rise or coastal hazards retreat as considered in this Project, it may be instructive of how to deal with retreat arising from a catastrophic event.

- HRS § 171-86 et al. (enacted in 1962 after the 1960 Hilo Tsunami) provides that the Board of Land and Natural Resources may dispose of lands at fair market value to victims of seismic or tidal waves, tsunami, hurricane, volcanic eruption, typhoon, earthquake or flood and under other specific statutory conditions. Thus, the State may provide lands – at a cost and not for free – to victims of specific natural disasters.
  - ⚠ Even though the State may make land available, there are still issues, such as whether there is infrastructure available to support a new community and who shall bear the costs of putting in the infrastructure if none presently exists. Some people will continue to want to return to hazard areas (Dayton, 2018).
  - ⚠ Another issue is whether owners of properties destroyed by lava are compensated at pre-disaster value to facilitate their ability to retreat and is it the public taxpayers who will be responsible for compensating owners.

Nags Head, North Carolina. Nags Head prepared a mitigation plan based on its repetitive history of coastline damage due to hurricanes. The plan included post-storm measures, including a building moratorium, reconstruction policies and a program for rapid acquisition of affected properties. New building standards were adopted that were stricter than those in either the Federal Emergency Management Agency (FEMA) or the State Coastal Area Management Act. Incentives were provided, which encouraged strict setbacks (150 feet from the mean high-water mark) and limited hotels and condominiums. New construction of wood frame, multi-story and multi-family buildings were prohibited. The cost of the acquisition plan compared favorably to a beach replenishment option (Neal et. al, 2005).

Applicability to Hawai'i: The Nags Head mitigation plan shows that accommodation and retreat may be used concurrently to plan for coastal hazards and sea level rise.

- Accommodation strategies, i.e., setbacks, more resilient building codes, etc., should be implemented where appropriate in vulnerable areas based on planning studies and decisions.
  - ⚠ However, even with additional setback and reconstruction policies, State and counties must be aware of entities with established entitlement or property rights, which may trigger litigation, if improperly expunged.
  - ⚠ As for acquisition of properties for retreat, this may be significantly more difficult in Hawai'i than North Carolina, given Hawaii's high coastal property values.

Houston, Texas. Since 1985, the Harris County Flood Control District has spent $342 million to purchase about 3,100 properties. They currently have $44 million to spend, which comes from a $10 million HUD grant and a $13.3 million FEMA grant. The balance is provided by County funds. The District has 3,300 plus homes on the priority buyout list, but that is only a small portion of the properties that flood each year. With Hurricane Harvey and major floods in 2015 and 2016, the program cannot keep up. While many people volunteer for the buyout program, only one in five qualify as being within the exceptionally high-risk zone (10-year floodplain) and meeting FEMA's benefit-cost analysis criteria. Despite the need, the County lists several challenges, as shown in the side bar box (Song et. al, 2017).

Harris County, TX Buyout Challenges

- Limited funds
- Competing priorities
- Strict criteria for buyouts
- Snail's pace of bureaucracy puts owners in limbo
- Private developers buy the houses and flip them, perpetuating the problem.

~ Texas Tribune, November 2, 2017

Applicability to Hawai'i: The FEMA National Flood Insurance Program (NFIP) provides coverage for properties subject to flooding, which is of concern in Hawai'i.

- FEMA provides funds to reduce or eliminate the long-term risks of flood damage to structures insured under the NFIP that have had one or more claim payment(s) for flood damages. See FEMA website.
  - ⚠ However, coastal erosion, which is a chronic condition and a coastal hazard, is different from in-land flood prone areas, such as what occurred in Houston, TX. Coastal erosion may lead to flooding but flooding due to coastal erosion may not be eligible for FEMA funding. Thus, FEMA federal buyout funds for coastal erosion related flooding may not apply to Hawaii's properties, unlike the situation in Houston.
  - ⚠ Further, given Hawaii's high coastal property values, it is uncertain how many properties may be retreated with limited federal funding and uncertain State funding, if any.
  - ⚠ Hawaii's challenges with implementing any buyout program for retreat will be the same, if not more, than Harris County Flood Control District's challenges.

Austin, Texas. The City of Austin Watershed Protection Department works with the Office of Real Estate Services to buy homes and move residents out of flood prone areas. According to a 2017 report by the Austin City Auditor, the City has administered ten buyout projects since the 1980's. Most were voluntary. The City of Austin pays owners the cost of the original home, a replacement housing payment to buy a comparable home, moving costs and closing costs (Office of the Austin City Auditor, February 2017).

According to the Watershed Protection Department website, as of May 2018 Austin had bought out almost all the homes in Lower Onion Creek neighborhood (811 homes) and nine on Upper Onion Creek. This is the largest and widest watershed and subject to repeated flooding. After several studies, buyout was selected as the preferred option. For funding, the City has used $100 million in local funding from bonds and a citywide drainage utility charge, plus $40 million in federal funds that came seven years after it was promised (Song et. al, 2017).

Applicability to Hawai'i: Hawai'i will need to identify specific areas to retreat to avoid parceling of areas, if and when managed retreat is determined to be the best option versus accommodation and/or protection strategies.

- The Austin retreat buyout program is instructive of the need to identify, prioritize and target a specific area for a successful retreat project. Otherwise, if an area is not specifically identified, prioritized and targeted for treat, piecemeal and fragmented retreat may occur, leaving communities divided, which is contrary to the united social and positive psychological factors necessary for a successful retreat (Hino et. al, 2017).
  - ⚠ However, given Hawaii's high coastal real estate prices, it is extremely doubtful that $140 million will buy 811 properties, which is equal to a little over $172,500 per home.
  - ⚠ Additionally, Hawai'i will likely experience similar challenges with implementing any buyout program for managed retreat as experienced by the Harris County Flood Control District.
- The Austin situation is similar to the Harris County Flood Control District's.
  - ⚠ However, unlike inland, low-lying flooding situations, coastal erosion and coastal hazards necessitating retreat may not be eligible to receive federal FEMA NFIP funds.

New York State. Following Superstorm Sandy (2013) which destroyed over 305,000 homes, the Mayor of New York proclaimed that the City would not retreat. By contrast, the State of New York offered a large-scale buyout program in Staten Island's East Shore, which was the hardest hit borough. The New York State Office of Storm Recovery offered to buy homes and vacant property at pre-storm values. Incentives were added for high-risk areas, group buyouts and staying in the same County after relocating. The program was available in select neighborhoods targeted by the State. The lands were to be used to create wetlands, open space and storm water management systems for a more resilient coastline that would provide a buffer against future storms. Participation was voluntary. By the end of the program, 299 homes were acquired for $122 million, and the buildings demolished. Funding for this came from a HUD Community Development Block Grant Disaster Recovery Grant in the amount of $16 billion, which was part of $60 billion in federal dollars appropriated for disaster assistance (New York State Governor's Office of Storm Recovery website, 2018).

Applicability to Hawai'i: The New York post-Super Storm catastrophic disaster event is instructive to Hawai'i of a successful managed retreat program.

- A specific area needs to be identified, prioritized and targeted for retreat to avoid fragmenting a community and having the State and county support infrastructure and emergency services to multiple, parceled communities, which results in added costs and personnel.
- Pre-storm property values were offered to people to incentivize retreat.
  - ⚠ As with New York's property values, Hawaii's pre-disaster property values will also range in the billions.
- Purchased properties should be used to create wetlands, open space and storm water management systems for a more resilient coastline that would provide a buffer against future storms and coastal erosion.

Examples of Chronic Hazard Events Leading to Managed Retreat Planning

Del Mar, California. In April 2018 the City of Del Mar California issued a *Revised Draft Adaptation Plan* to serve as the city's "toolbox" to help property owners address sea level rise, storm surge, coastal flooding and erosion (City of Del Mar, 2018). This followed a 2016 report on *Coastal Hazards, Vulnerability, and Risk Assessment*. Del Mar's entire western edge is coastal. The California Coastal Commission has a priority goal for local governments to complete a Local Coastal Program that addresses sea level rise. Del Mar's voters approved a Beach

Preservation Initiative stating acceptable levels of risk and community priorities (City of Del Mar, 2018).

The draft strategies included in the *Revised Draft Adaptation Plan* initially were: Protection, Accommodation and Retreat. During a public comment period, the proposal for managed retreat strategy was received negatively. Residents felt even considering such an option would hurt their property values. There were further concerns that oceanfront homes could trigger restrictions in lending practices by financial institutions and affect funding of private property purchases, improvements or modifications. This could lead to a "cash only" real estate market, reducing the economic diversity in Del Mar (City of Del Mar, 2018).

The Sea Level Rise Technical Advisory Committee (STAC) evaluated this input and felt it was "too early in the process to include retreat as an adaptation strategy in Del Mar. At this time, retreat is intentionally not included as an adaptation option for private property. STAC recommends that the City prioritize beach nourishment in conjunction with sand retention." (City of Del Mar, 2018).

***Applicability to Hawai'i*:** Del Mar's high coastal property values mirror Hawaii's coastal communities and may be instructive of the discourse that may occur when managed retreat policy is discussed in Hawai'i.

- Owner skepticism and opposition in Hawai'i should be anticipated due to perceptions of how managed retreat affects property values and property rights in areas to be classified as vulnerable or threatened. In Del Mar, this made it politically unpalatable to go forward with retreat at the current time. Thus, it may be more feasible for a community to focus on infrastructure retreat projects to protect critical infrastructure, e.g., hospitals, waste water facilities, electrical generation facilities, etc. in hazardous areas, than initially concentrating on private property.
- Managed retreat should be discussed along with protection and accommodation strategies and is not the sole strategy for coastal communities to pursue.
- Managed retreat is a long-range planning solution for chronic hazard events and should be considered in a State and county's long-range plans. State and county planning systems guide decision-making for what uses are permitted in and around the shoreline and what land use patterns and densities are necessary to accommodate projected demographic and environmental changes. They also address the siting and management of critical infrastructure, public services and facilities and natural resources and ecosystems. Therefore, State and county's long-range plans will need to be updated if managed retreat is to be properly implemented.

New Orleans, Louisiana. According to a story on National Public Radio (NPR) in January 2018, after Hurricane Katrina, President Barack Obama ordered federal agencies to work together to prepare for climate-related changes. In 2016 the Obama administration awarded $48 million to relocate the tiny coastal community of Isle de Jean Charles (previously described in this chapter). There are no funds for future relocations, and President Trump has rescinded the Obama order on climate change (NPR, 2018).

Subsequent hurricanes Rita, Gustav, Ike and Isaac furthered the need to increase resiliency in the face of inevitable vulnerabilities. The State of Louisiana urged residents to resettle onto higher, safer ground. A plan was crafted to buy out the most vulnerable homes at fair market value, but to date the State has no money to put that plan into action. The estimated program cost is $1.2 billion (NPR, 2018).

Louisiana is the first state to adopt a massive program to move development out of coastal areas threatened by sea level rise and coastal erosion. The program declares as uninhabitable a coastal area of the Gulf of Mexico larger than Delaware, according to Bloomberg News reporter Christopher Flavelle (Flavelle, 2017). The program calls for prohibition of building new homes in high risk areas, buyouts of homeowners who live there now and hikes in taxes to pay for this. The program is called *Louisiana Strategic Adaptations for Future Environment* (LA SAFE) and it was undertaken by the Louisiana Office of Community Development Disaster Recovery Unit to complement the 2012 Coastal Master Plan (LA SAFE, 2018).

One of the sections of the plan, "Resettle" addresses at the subject of moving people from their homes. Nine principles of resettlement are presented, as shown in the box.

Nine Principles of Resettlement, Louisiana Strategic Adaptations for Future Environment

- Unless there is a clear and present risk to life all resettlements must be community-driven and voluntary.
- Resettlements must be anticipatory of future risk but also aspirational for future communal opportunity.
- Activities must include building and bridging social networks as part of the process and outcome.
- Where prudent, appropriate and desirable, approaches should envision scenarios by which resettled communities retain access to abandoned lands for cultural, social or economic reasons.
- All resettlement activities must lead to a demonstrable reduction in current and future risk for the participating communities.
- When possible, all resettlements should occur within common jurisdictional boundaries.
- Communities envisioned and constructed through resettlement must take a holistic approach toward development, inclusive of cultural, social and economic growth opportunities and techniques.
- All resettlements, on a defined time horizon, must envision and plan for a total residential abandonment of the original community.

~ LA SAFE, 2018

The section cites a 2014 issue paper by the Tulane Institute on Water Resources Law and Policy which states that dislocation has proven more effective for individuals than resettling entire communities, however both are difficult. In particular, funding has proven unreliable or unsustainable. "The history of population dislocation in Southeast Louisiana is generally one of failed government intervention. Some communities have been driven away by flooding. Some have disappeared because of public works projects. Still others have maintained community integrity despite a lack of government consideration and assistance. Where resettlement efforts have been undertaken, they have been curtailed or limited for political or philosophical reasons. This history has led to an ingrained public distrust of relocation or resettlement projects." (Tulane Institute on Water Resources Law & Policy, 2014).

Applicability to Hawai'i: The LA SAFE resettlement principles are illustrative of how a large-scale retreat should be a multi-year, multi-agency coordinated effort.

- For a statewide retreat initiative, there needs to be a statewide program dedicated to resettling of coastal areas.
- The nine principles articulated for a long-term managed retreat strategy have transferability, albeit with a need to make them Hawai'i-centric.
  - ⚠ As shown in Louisiana, a large infusion of federal funds is not guaranteed and may evaporate before the work is fully complete.
- LA SAFE focuses on a community-driven approach to having honest and difficult conversations about the realities of coastal hazards and sea level rise, which results in community-based decision making for retreat.
- It is useful to identify areas for relocation and pilot projects for retreat developed from community meetings.
  - ⚠ There needs to be established criteria when assessing areas under consideration for retreat. For LA SAFE, they were: public preference; ability to leverage funds; benefits for low-income residents; qualitative and quantitative public benefits; and points earned in the FEMA Community Ratings System to reduce flood insurance rates (Bahr, 2018).

Terrebone Parish, Louisiana. On a smaller scale, following Hurricane Isaac in 2012, LA SAFE received funds from a HUD long-term Disaster Recovery Grant. They recognized that they needed to develop a suite of adaptation projects to address future flood risk and land loss expected in the years ahead. The plan would need to receive community support by including communities as partners in the retreat / relocation process. The processes used were designed to include community groups and individuals living in six parishes affected by Hurricane Isaac. Over five rounds of meetings were held. Alternatives were identified, evaluated by the community and voted upon. In Terrebonne Parish, one of the programs selected was Relocation Assistance for Permanent Resident Households, to relocate homeowners living outside the structural protection system. Most of the people affected were residents of Isle de Jean Charles. The program would provide relocation assistance to approximately seven persons

who are not part of the resettlement program. Conservation easements and other regulations would restrict resettlement of the affected areas. This is a voluntary program.

Applicability to Hawai'i: The lesson from Terrebone Parish is that even with a long-range relocation, retreat plan, it may be necessary to develop specialized assistance in unique circumstances to facilitate resettling.

- It is crucial to have the public involved in preparing retreat plans for the broadest buy-in possible.
- Community support is critical to a successful managed retreat plan.

C. THE BACKGROUND RESEARCH REVEALED COMMON THEMES PERTINENT TO A MANAGED RETREAT PROJECT

The literature review indicates several key points pertinent to a successful managed retreat program. The provided list below is in no order of importance, significance and/or consequence. Regardless of whether retreat is necessitated by a catastrophic event, such as a storm, or chronic coastal hazards, such as sea level rise or erosion, Hawai'i needs to:

- Determine whether retreat is the solution versus accommodation and/or protection, because not all coastal areas can be retreated.
- Develop a criteria list to determine which areas (or facilities) will be retreated. It will not be possible to retreat the entire coastline for all the Hawaiian Islands. Thus, Hawai'i will need to develop a balanced and just ranking system to determine which areas will be retreated.
- Review its State and county land use to determine where it may be possible, meaning where there is available land, given competing priorities such as agricultural production, conservation holdings, open space, military uses, etc. – to retreat inland.
- Incorporate managed retreat into the State and county's long-range planning frameworks. Comprehensive planning must be utilized for retreat to be successful. Comprehensive planning will help communities redevelop with the necessary infrastructure and entire communities will not needlessly be fractured / fragmented when retreat occurs. It will be necessary to update planning frameworks at multiple levels to implement a successful managed retreat strategy.
- Adopt / amend laws and/or regulations supportive of retreat, such as armoring restrictions, rebuilding restrictions, structure removal requirements, acquisition and buyout programs, conservation easements, rolling easements, etc.
- Obtain some level of community agreement and understanding for there to be successful retreat.
- Ensure that open space and wetlands are preserved, when retreat occurs, as a buffer against future storms and coastal erosion and for public access.
- Secure federal, state and private funding to enable retreat.

D. HOW WAS THE BACKGROUND RESEARCH USED IN THE PROJECT?

The Background Research was used to guide focus groups assembled for the four Hawai'i Scenario Profiles, as shown in Chapter 3. The Background Research indicated common themes pertinent to every managed retreat program and the common themes were used to lead the focus group discussions and to further elicit the unique areas of concerns specific to the individual Scenario Profiles.

The common themes are listed below:

COMMON THEMES IN MANAGED RETREAT PROGRAMS	TOP AREAS IDENTIFIED IN THE BACKGROUND RESEARCH NECESSARY FOR A MANAGED RETREAT PROGRAM
Social/Cultural/Historic/Education	Community Participation
Planning	Comprehensive Planning for Retreat
Resiliency	Determine whether to Retreat, Accommodate and/or Protect
Regulatory/Legal	Incorporate Retreat into State and County Land Use and Shoreline Management Laws
Economic	Need for Funding for Retreat
Shoreline Management/Public Access	Preservation of Open Space and Wetlands after Retreat Occurs

CHAPTER 3: SYNTHESIS OF RELEVANT INFORMATION FROM THE HAWAIʻI SCENARIO PROFILES AND MANAGED RETREAT SYMPOSIUM

Chapter 3 describes information amassed during the four Hawaiʻi Scenario Profiles generated to assess the feasibility of a managed retreat program in Hawaiʻi. The Scenario Profiles are not representative of a specific place or locale, but instead are sample, model and representative portraits of locations along Hawaiʻi coastal areas which may be considering retreat due to sea level rise and/or other coastal hazards. Thus, the Scenario Profiles referenced in this Report and Project cannot be viewed as identifying a specific area of Hawaiʻi. Each Scenario Profile is fictitiously created with a set of coastal factors to simulate the need for retreat.

Each of the four model Hawaiʻi Scenario Profiles was located on a different island and addressed a different development type. The model for each Scenario Profile, while representing a specific development type – Resort/Hotel/Condominium, Infrastructure, Urban Area, and Single-Family Home – and located on a specific island, is intended to be transferable to any Hawaiʻi island. For example, the Resort/Hotel/Condominium Scenario Profile was situated on Maui but the conclusions and hypotheses reached may be applicable to any Resort/Hotel/Condominium Scenario Profile on any Hawaiʻi island. Input was received during site visits and collected from facilitated focus groups based on common themes identified through the Background Research. The salient points identified or needed to be further pursued are described after each Scenario Profiles and then compiled collectively.

This Chapter also contains information from the managed retreat Symposium, which was held January 11, 2018 at Aloha Tower Marketplace in Honolulu. The Symposium was a way to validate some of the results of the Background Research and Scenario Profiles. The two keynote speakers from California and New Jersey shared their experiences implementing specific managed retreat projects. The balance of the Symposium involved four panels with Hawaiʻi experts in the following topic areas: Finance/Tax/Economics; Legal/Policy; Insurance; and Open Space/Public Access/Social Justice.

While the model Scenario Profiles and the Symposium understand that there are adaptation strategies to climate change and sea level rise other than retreat – mainly accommodation and protection, the Scenario Profiles and the Symposium asked focus group participants, speakers and panelists to address managed retreat considerations and feasibility reviews extracted from the Background Report and Scenario Profiles.

A. SCENARIO PROFILE

Scenario Profile One: Scenario for Resorts, Hotels and Condominiums (Maui)

Figure 2: Condominiums, Hotels and Resorts Scenario (Maui Scenario Profile). Figure 2 is a graphic depicting some of the environmental, social and economic threats in retreating condominiums, hotels and resorts in Hawai'i. This graphic was developed for an island-specific scenario profile. While many features shown reflect conditions that can be found across the state, some may be island specific, and conditions may also vary across sites. (Credit: SSFM)

Scenario Profile Setting: The Maui Scenario Profile examined hotels, resorts and condominiums along Maui's beachfronts. The beachfront area provides substantial economic value to the county and State from the tourism industry in the form of tax revenue and tourism direct spending. The condominiums include both leasehold and fee simple ownership structures. While some owners own their properties free and clear, some owners have mortgages with attendant insurance

requirements. Owners in condominiums are required to pay maintenance fees for the upkeep of the common areas of the project. Some owners in a condominium are owner-residents, while others own their properties for investment purposes as long or short-term rentals. Some condominiums are timeshares, adding another layer of administrative management.

The resorts and hotels are generally owned by a single entity, such as a corporation or a hedge fund.

Most of the development inland of the coastal highway is situated within the tsunami evacuation zone and are within the NFIP VE Zone, where there is a 1% annual chance of inundation by a flood event and the additional hazard of storm-induced velocity wave action. If a 100-year flood were to occur, some stretches of the State highway would become inundated and some communities could be left inaccessible.

The beaches and coastal resources are also cherished spaces, with critical habitats and recreational uses. Additionally, this area is important to Native Hawaiian history and culture. Native subsistence and recreation activities occur here and public access is protected by the Hawai'i State Constitution. The proximity of hotels, resorts and condominiums to the ocean means that iwi kupuna (Native Hawaiian bones), archaeological resources or historic properties can be anticipated.

Image: Disappearing shoreline along resort and condo development on Maui (Credit: Abbey Seitz)

The area's resorts, hotels and condominiums lining the coast are aging and are heavily impacted by an actively eroding shoreline and annual flooding and inundation during the winter tides. Sea level rise impacts come from wave inundation, wave over wash and coastal erosion. Maintenance of the buildings at the water's edge is a challenging and expensive undertaking. Seawalls and shoreline armoring exist in some locations, which have resulted in additional, significant beach loss along neighboring properties and loss of critical habitat and cultural resources.

Beach replenishment projects have been completed in some areas and are under review in other areas. While some buildings have chosen to protect their property through hard armoring and through beach re-nourishment, these protection methods are costly and require repair and renewal, necessitating engaging (and re-engaging) in lengthy and expensive permitting processes.

Scenario Profile Focus Group: The Maui hotels, resorts and condominiums Scenario Profile focus group involved 17 participants, including residents and managers of condominiums, a Hawaiian cultural advisor, a DLNR land agent, an emergency management hazard mitigation officer, a representative from a Maui taxpayer association, a land trust member and engineers and planners.

Summary of Points Raised: The common themes for a successful managed retreat project identified in the Background Research were used to guide discussions during the Maui Focus Group Scenario Profile. The salient points identified or needed to be pursued further for each common theme related to the Maui Scenario Profile of hotels, resorts and condominiums are listed below in **Table 1**.

TABLE 1: COMMON THEMES GUIDING RESORTS, HOTELS AND CONDOMINIUMS FOCUS GROUP DISCUSSIONS RELATING TO MANAGED RETREAT

COMMON THEMES	SALIENT POINTS IDENTIFIED OR NEED TO BE PURSUED
Social/Cultural/Historic/Education	• Need some level of community understanding / agreement as to when to retreat. • Need younger generation involvement in the retreat decision making as climate change affects the younger generation. • Need legislators to understand the retreat issue and act (political will) on it in when necessary.
Planning	• Need to know where there are available inland lands to retreat to. • Need to know of available mechanisms, such as conservation easements or zoning changes, to acquire inland lands to retreat to. • Owners need to be more proactive and should not wait until a building is endangered from coastal hazards to consider retreat. • Any long-range planning for retreat needs to adopt an Hawaiian ahupua`a system – mountain to the sea – of resource management and planning.
Resiliency	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines.
Regulatory/Legal	• Owners need a better understanding of how insurance will cover or not cover their losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc. • Owners need a better understanding of building codes, shoreline setbacks, and various soft and hard protection and accommodation methods and their environmental impacts and regulatory processes to plan for coast hazards and sea level rise. • If a condominium project is to be retreated, owners need a better understanding of the owner approval requirements. The percentage of owner approval required to retreat may range from 67% to 100%, depending on legal requirements. If owners have mortgages, their lenders may also need to approve of the

	retreat plan as it affects their security interests in the properties.
Economic	• Resorts, hotels and condominiums along the shore provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue. • Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly. • Retreat is expensive and there are competing public needs for public funds.
Shoreline Management/Public Access	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.

Scenario Profile Two: Scenario for Urban Areas (Kaua'i)

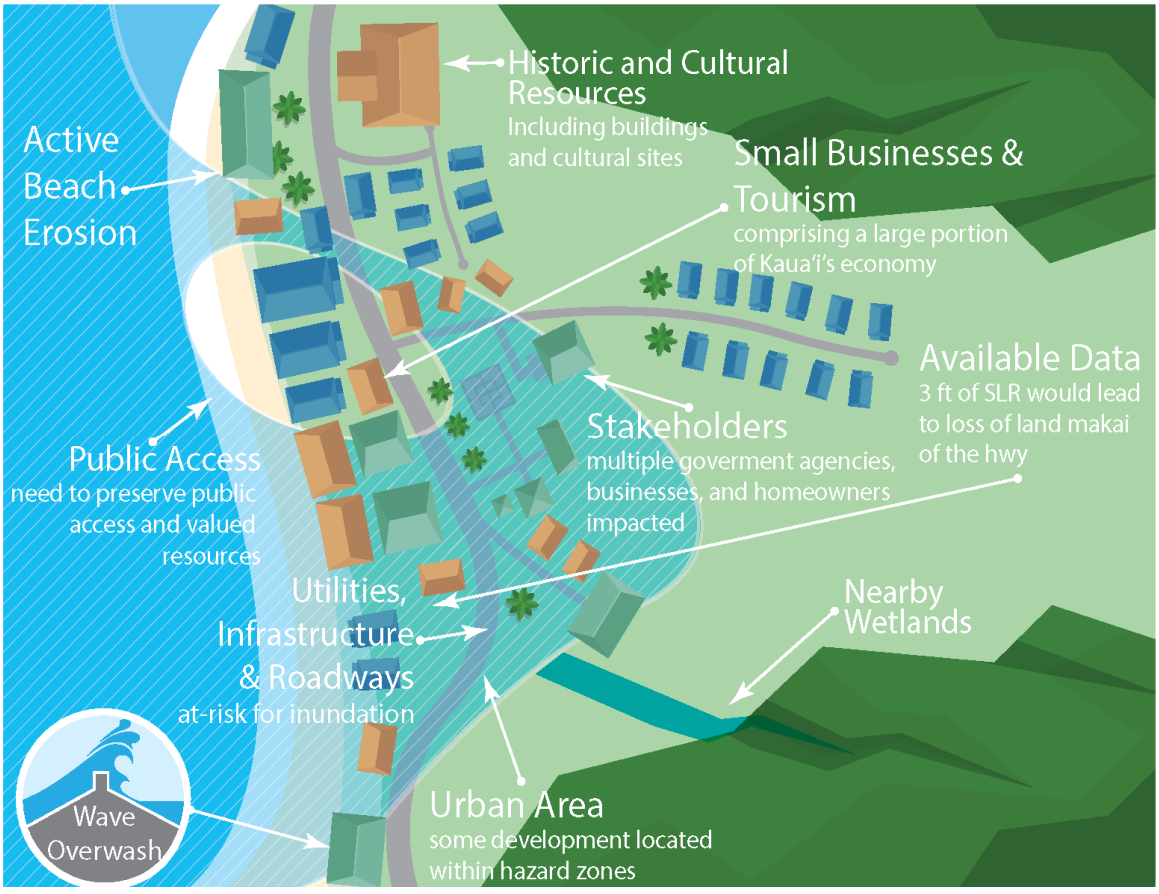

Figure 3: Urban Area (Kaua'i Scenario Profile). Figure 3 is a graphic depicting some of the environmental, social and economic considerations in retreating urban areas in Hawai'i. This graphic was developed for an island-specific scenario profile. While many features shown reflect conditions that can be found across the state, some may be island specific, and conditions may also vary across sites. (Credit: SSFM)

Scenario Profile Setting : The Kaua'i Scenario Profile examined urban areas. In general, urban areas are concentrated in low-lying areas around the coastal zone. While low elevation and flat topography are hospitable to development, these same features create vulnerabilities to periodic flooding, and potentially permanent inundation. In some areas, significant portions of town centers and commercial districts are threatened. Depending on localized conditions, impacts will look different. Some areas will experience severe impacts from groundwater inundation. Some have coastal roads and highways that could be undermined. Inland wetlands may grow as ground water rises to the surface, creating a 'barrier-island' effect that could isolate or reduce access to coastal communities.

There are a variety of land uses and development types present in urban areas, such as residences and businesses, as well as roads, utilities, public facilities and critical infrastructure. Any potential retreat strategies must consider the various physical and social factors present in the different structures.

Image Below: Sandbangs protect an uban area on Kauai (Credit: Abbey Seitz).

Image Left: Image: Erosion along the Ke Ala Hele Makalae bike path on Kaua'i (Credit: Abbey Seitz).

Along with the many land uses and development types, the consideration of equity issues is extremely important in this Kaua'i Scenario Profile. The challenges of providing services in urban areas, particularly for economically and socially disadvantaged populations, becomes even more daunting when considering the future potential to retreat communities that are likely to become inundated.

Sea level rise impacts from wave inundation, wave over wash and erosion are already occurring in some urban areas and will continue to worsen. Development and structures located on the water edge will become more and more difficult to maintain. Some areas have beach replenishment projects completed. Some seawalls exist along with other hardening. Groundwater inundation is not expected to be severe. Most of the shoreline highway is in the NFIP VE Zone, which indicates a 1% annual chance of experiencing a flood event, with additional hazards due to storm-induced velocity wave action.

Chronic erosion will be further exacerbated by sea level rise. Most of the development makai (oceanside) of the highway, such as in Kapa'a, will become inundated with approximate three feet of sea level rise.

Given the high value of the physical assets along its coastal urban areas, Kaua'i may have to choose to invest in accommodation and protection activities to mitigate flooding in lieu of retreat. The expectations of residents will be an important consideration in future strategies.

Scenario Profile Focus Group: The Kaua'i urban area Scenario Profile focus group involved 13 participants including representatives from developers, hotels, the Chamber of Commerce, the insurance industry, Kaua'i Island Utility Cooperative and planners from the County.

Summary of Points Raised: The common themes relative to a managed retreat project identified in the Background Research were used to guide discussions during the Kaua'i focus group Scenario Profile. The salient points identified or needed to be pursued further for each common theme related to the urban area Kaua'i Scenario Profile are listed below in **Table 2**.

TABLE 2: COMMON THEMES GUIDING URBAN AREA FOCUS GROUP DISCUSSIONS RELATING TO MANAGED RETREAT

COMMON THEMES	SALIENT POINTS IDENTIFIED OR NEED TO BE PURSUED
Social/Cultural/Historic/Education	• Need some level of community understanding / agreement as to when to retreat. • Need legislators to understand the retreat issue and act (political will) on it in when necessary. • Need consideration of social equity / justice issues when discussing retreat and retreat should not disproportionately impact or displace economically disadvantaged.
Planning	• Need long-range planning for retreat, given that urban areas encompass many development types, and retreat will therefore require a phased strategy that relocates the different developments over a long period of time. • Need to know where there are available inland lands to retreat to. This may result in changing State and county land uses and county zoning codes and involving major private landowners to ensure available lands for retreat. • Need to know that there will be available infrastructure, i.e., water, electricity, sewer, roads, etc., to support the retreating population. • Need to ensure that there will be affordable housing projects for social justice and equity issues.
Resiliency	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact Kaua'i.
Regulatory/Legal	• Owners need a better understanding of how insurance will cover or not cover their losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc. • Private parties and government entities need a better understanding of the legal issues surrounding takings, eminent domain and condemnation to require individuals to retreat.

Economic	• Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly through loans, grants, etc. • Urban areas provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue.
Shoreline Management/Public Access	• Need assurance that vacated areas are not redeveloped after retreating from them. • If retreat is to occur, the result must end in having greater public access / recreation for all residents.

Scenario Profile Three: Scenario for Retreat of Single Family Homes (Hawai'i Island)

[Author Note: Since this scenario profile was conducted, in May 2018 the entire area of Kapoho (including the home in the picture) became buried by lava flowing from Kīlauea Volcano. All homes in the area and the roads no longer exist and even the bay has been filled with lava creating nine acres of "new land." Nevertheless, this scenario is included because the issues it illustrates are relevant to many other places in Hawai'i.]

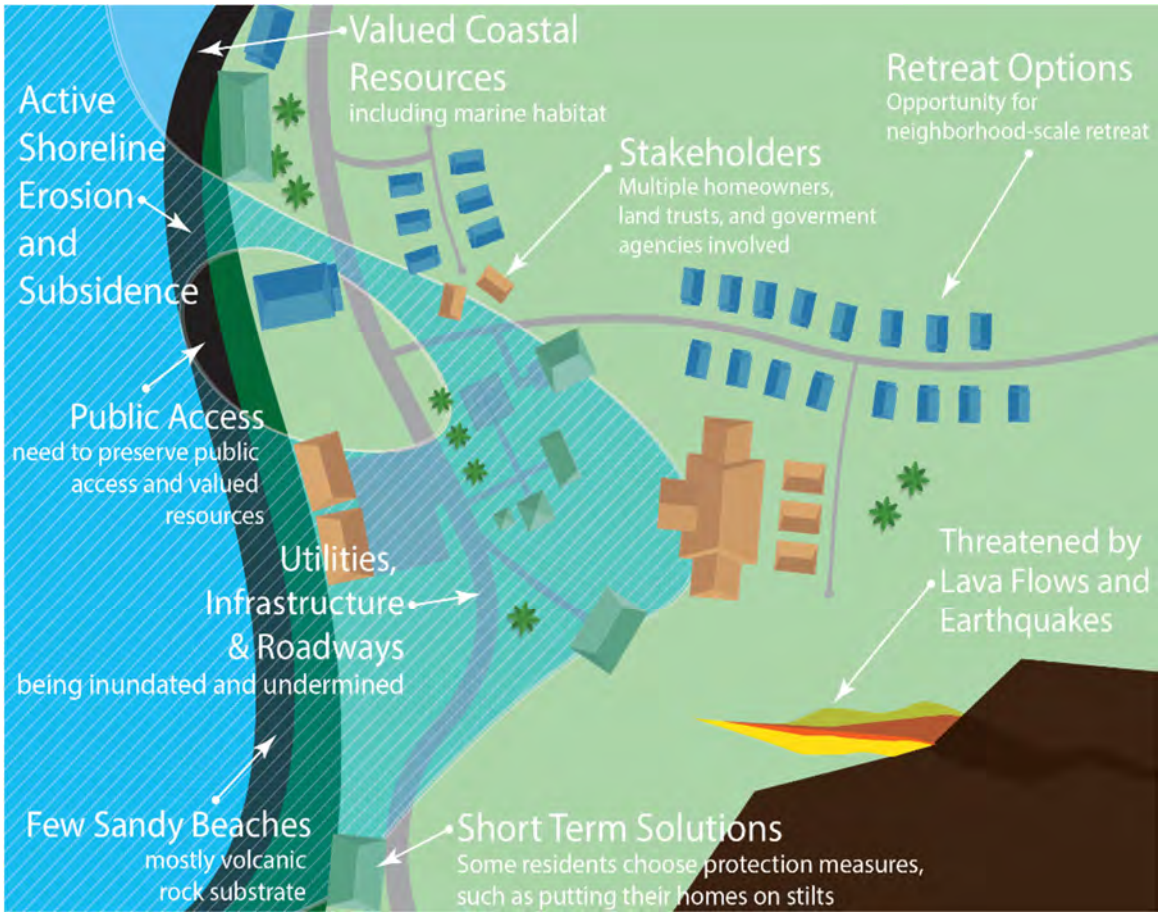

Figure 4: Single-Family Homes (Hawai'i Scenario Profile). Figure 4 is a graphic depicting some of the types of environmental, social and economic considerations in retreating coastal single-family residential communities in Hawai'i. While many features shown reflect conditions that can be found across the state, some may be island specific, and conditions may also vary across sites. (Credit: SSFM)

Image: A single family home on Hawai'i Island (Credit: Abbey Seitz)

Scenario Setting: Many of Hawaii's single-family residential areas are situated on or near the coast in areas that have become increasingly vulnerable to sea level rise, coastal erosion and periodic flooding associated with high tides and storms. In some areas, residents already face flooding every month with the high tides. In other areas, seasonal patterns of wave action and erosion are moving the shoreline further and further inland, reducing the size of the properties and in some cases, damaging or undermining structures. The long-term inevitability, as these processes continue, is that many single-family homes will become uninhabitable and, in some cases, entire neighborhoods will become inaccessible as streets become flooded.

Given the predicted impacts of sea level rise and other coastal hazards, managed retreat of entire coastal neighborhoods may become necessary in some areas if accommodation and protection are not viable adaptation solutions. Some owners are already elevating their homes by placing them on stilts or pilings.

As with condominiums, single-family homes include both leasehold and fee simple ownership structures. While some single-family owners own their properties free and clear, some owners have mortgages with attendant insurance requirements. Those single-family owners who own their properties free and clear may have inherited their properties and live modestly along the coast as owner-residents. Others may be non-owner residents and use their properties for investment purposes as long or short-term rentals.

Scenario Profile Focus Group: The Hawai'i single-family Scenario Profile focus group was attended by ten participants, including residents, a State legislative representative, members of the County Planning Department and members of the County Open Space Commission.

Summary of Points Raised: The common themes relative to a managed retreat project identified in the Background Research were used to guide discussions during the single-family homes Hawai'i focus group Scenario Profile. The salient points identified or needed to be pursued further for each common theme related to the single family Hawai'i Scenario Profile are listed below in **Table 3**.

TABLE 3: COMMON THEMES GUIDING SINGLE-FAMILY HOMES FOCUS GROUP DISCUSSIONS RELATING TO MANAGED RETREAT

COMMON THEMES	SALIENT POINTS IDENTIFIED OR NEED TO BE PURSUED
Social/Cultural/Historic/Education	• Owners and those considering living along the coast need a better understanding of coastal threats, such as coastal erosion and sea level rise hazards, and the adaptation strategies – accommodation, hardening and retreat – available to counter the hazards. Elevation may not work and seawalls will cause severe beach erosion on neighboring properties.

	• Need to have maps with sea level rise projections overlaid with development patterns to provide owners and those considering living along the coast with a better understanding of sea level rise potential impacts.
Planning	• To adequately plan for coastal hazards and sea level rise, there needs to be unified shoreline setbacks among counties and consistent sea level rise projections statewide. • Need to know where there are available inland areas to retreat to that is not low-lying. • Need long-range planning for retreat, encouraging inland development.
Resiliency	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines.
Regulatory/Legal	• Need rebuilding restrictions to facilitate retreat and accommodation where appropriate. • Need enhanced real estate disclosure laws to inform people of the risks of living along the coast, i.e., whether the property is in sea level rise area and at what feet, suffers from chronic coastal erosion, is in a tsunami evacuation zone, etc. • Need higher taxes in vulnerable areas to facilitate the additional emergency management services required to service facilities in vulnerable areas, such as repairing chronically flooded infrastructure.
Economic	• Single-family homes along the shore provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue. • Retreat is expensive and there is not an understanding of who pays for the relocation of the single-family homes and how funds will be raised either privately or publicly.
Shoreline Management/Public Access	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.

Scenario Profile Four: Scenario for Critical Infrastructure (O'ahu)

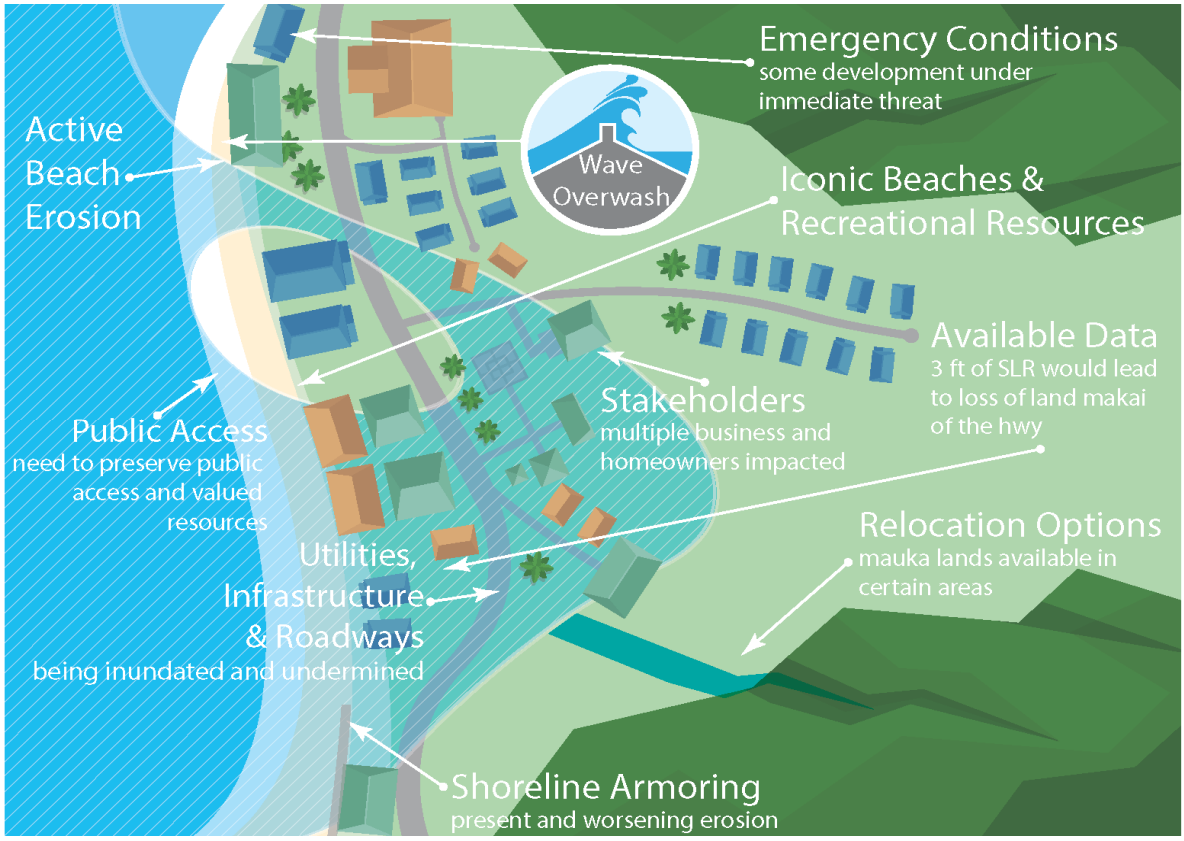

Figure 5: Critical Infrastructure (O'ahu Scenario Profile). Figure 5 is a graphic depicting some of the types of environmental, social and economic considerations in retreating critical infrastructure in Hawai'i. This graphic was developed for an island-specific case study. While many features shown reflect conditions that can be found across the state, some may be island specific, and conditions may also vary across sites. (Credit: SSFM)

Scenario Setting: The O'ahu Scenario Profile centered on critical infrastructure. Critical infrastructure includes the public and private facilities that are essential for the delivery of vital services, from transportation infrastructure to energy supply, water, wastewater, drainage, flood protection and buildings that house equipment and administrative functions. Much of Hawaii's critical infrastructure, including major highways, sewage lines, power plants and utility infrastructure, is located within vulnerable coastal areas. This is particularly true for the State's transportation infrastructure, including harbors, airports, highways and transit ways. Much of the State's highway system follows the coastline and serves as the main connection to other communities and essential urban areas.

Image: Shoreline encroaching on a roadway on O'ahu (Credit: Abbey Seitz)

For example, a typical state highway in West Oʻahu is the only access road in the region. Most of the development makai (oceanside) of the highway is within the NFIP VE Zone, areas which have a 1% annual chance of experiencing a flood event, with additional hazards due to storm-induced velocity wave action. Some stretches of the highway would be inundated if a 100-year flood or tsunami occurred, leaving some communities in West O'ahu inaccessible. The roads which run along our coastline include electrical, sewer, communication and water lines. Moving the road would impact these utilities with their corresponding easements for use from private and public entities as well.

Similar to the O'ahu Scenario Profile with a state road / highway built along the shoreline now experiencing erosion, this problem also exists on other Hawaiian Islands with the same or similar critical infrastructure issues.

Scenario Focus Group: The O'ahu critical infrastructure Scenario Profile focus group was attended by the project team and eleven other participants from the following fields: insurance, real estate, electric utility, Sierra Club, Surfrider Foundation, State Departments of Transportation and Health and the County Department of Parks and Recreation. The O'ahu critical infrastructure Scenario Profile focus group observed that much of the coastal infrastructure, mainly the State highway, are aging and being degraded by eroding beaches, wave inundation and overtopping waves in the winter.

Image: Erosion of bike path along Sunset Beach on O'ahu (Credit: Rafael Bergstrom).

A shift in land use planning and policy would likely need to be the driving influence to relocate highways away from vulnerable coastal areas. Many others would also need to be involved besides transportation agencies, including County Planning Departments, the U.S. Army Corps of Engineers, Parks and Recreation departments, Hawaiian Electric Company (whose poles run along the highway) and others. Retreat would require a unified vision and collaboration.

Summary of Points Raised: The common themes relative to a managed retreat project identified in the Background Research were used to guide discussions during the critical infrastructure O'ahu focus group Scenario Profile. The salient

points identified or needed to be pursued further for each common theme related to the critical infrastructure O'ahu Scenario Profile are listed below in **Table 4**.

TABLE 4:COMMON THEMES GUIDING CRITICAL INFRASTRUCTURE FOCUS GROUP DISCUSSIONS RELATING TO MANAGED RETREAT

COMMON THEMES	SALIENT POINTS IDENTIFIED OR NEED TO BE PURSUED
Social/Cultural/Historic/Education	• Need a better understanding of coastal threats, such as coastal erosion and sea level rise hazards, and the adaptation strategies – accommodation, hardening and retreat – available to counter the hazards. Elevation may not work and seawalls may cause severe beach erosion on neighboring properties. • Need some level of community understanding / agreement as to when to retreat. • Need legislators to understand the retreat issue and act (political will) on it in when necessary.
Planning	• Need long-range planning for retreat, which may result in amending the State Land Use laws and county zoning changes. • Need to know of available mechanisms, such as land swap, to acquire inland lands to retreat to. • Need to increase infrastructure capacity. • Need to revise shoreline certification and permitting processes to reflect accurately the hazards of coastal environments, i.e., risk assessment planning approach.
Resiliency	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines. • Need enhanced pre-disaster recovery planning for catastrophic events.
Regulatory/Legal	• Need rebuilding restrictions to facilitate retreat and accommodation where appropriate. • Need to change insurance laws to accurately cover losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc.
Economic	• Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly through loans, grants, etc. For example, should there be a carbon tax or a reserve fund to pay for the true price of public services (e.g., amount of water we use) to fund necessary services like retreat?
Shoreline Management/Public Access	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.

Summary of the Four Scenario Profiles and their Common Themes:

Even though the four Scenario Profiles – Resort/Hotel/Condominium, Infrastructure, Urban Area and Single-Family Home – were quite disparate, the focus group discussions for each one produced common overarching themes to support a cohesive retreat process. A collective chart summarizing the four Scenario Profiles shows the similarities.

COMMON THEMES	RESORTS, HOTELS AND CONDOMINIUMS	URBAN AREA	SINGLE-FAMILY HOMES	CRITICAL INFRASTRUCTURE
Social/Cultural/ Historic/Education	• Need some level of community understanding / agreement as to when to retreat. • Need younger generation involvement in the retreat decision making as climate change affects the younger generation. • Need legislators to understand the retreat issue and act (political will) on it in when necessary.	• Need some level of community understanding / agreement as to when to retreat. • Need legislators to understand the retreat issue and act (political will) on it in when necessary. • Need consideration of social equity / justice issues when discussing retreat and retreat should not disproportionately impact or displace economically disadvantaged.	• Owners and those considering living along the coast need a better understanding of coastal threats, such as coastal erosion and sea level rise hazards, and the adaptation strategies – accommodation, hardening and retreat – available to counter the hazards. Elevation may not work and seawalls may cause severe beach erosion on neighboring properties. • Need to have maps with sea level rise projections overlaid with development patterns to provide owners and those considering living along the coast with a better understanding of sea level rise potential impacts.	• Need a better understanding of coastal threats, such as coastal erosion and sea level rise hazards, and the adaptation strategies – accommodation, hardening and retreat – available to counter the hazards. Elevation may not work and seawalls will cause severe beach erosion on neighboring properties. • Need some level of community understanding / agreement as to when to retreat. • Need legislators to understand the retreat issue and act (political will) on it in when necessary.
Planning	• Need to know where there are available inland lands to retreat to. • Need to know of available mechanisms, such as conservation easements or zoning changes, to acquire inland lands to retreat to. • Owners need to be more proactive and should not wait until a building is endangered from coastal hazards to consider retreat. • Any long-range planning for retreat needs to adopt an Hawaiian ahupua`a system – mountain to the sea – of resource management and planning.	• Need long-range planning for retreat, given that urban areas encompass many development types, and retreat will therefore require a phased strategy that relocates the different developments over a long period of time. • Need to know where there are available inland lands to retreat to. This may result in changing State and county land uses and county zoning codes and involving major private landowners to ensure available lands for retreat. • Need to know that there will be available infrastructure, i.e., water, electricity, sewer, roads, etc., to support the retreating population. • Need to ensure that there will be affordable housing projects for social justice and equity issues.	• To adequately plan for coastal hazards and sea level rise, there needs to be unified shoreline setbacks among counties and consistent sea level rise projections statewide. • Need to know where there are available inland areas to retreat to that is not low-lying. • Need long-range planning for retreat, encouraging inland development.	• Need long-range planning for retreat, which may result in amending the State Land Use laws and county zoning changes. • Need to know of available mechanisms, such as land swap, to acquire inland lands to retreat to. • Need to increase infrastructure capacity. • Need to revise shoreline certification and permitting processes to reflect accurately the hazards of coastal environments, i.e., risk assessment planning approach.

COMMON THEMES	RESORTS, HOTELS AND CONDOMINIUMS	URBAN AREA	SINGLE-FAMILY HOMES	CRITICAL INFRASTRUCTURE
Resiliency	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines.	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact Kaua'i.	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines.	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines. • Need enhanced pre-disaster recovery planning for catastrophic events.
Regulatory/Legal	• Owners need a better understanding of how insurance will cover or not cover their losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc. • Owners need a better understanding of building codes, shoreline setbacks, and various soft and hard protection and accommodation methods and their environmental impacts and regulatory processes to plan for coast hazards and sea level rise. • If a condominium project is to be retreated, owners need a better understanding of the owner approval requirements. The percentage of owner approval required to retreat may range from 67% to 100%, depending on legal requirements. If owners have mortgages, their lenders may also need to approve of the retreat plan as it affects their security interests in the properties.	• Owners need a better understanding of how insurance will cover or not cover their losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc. • Private parties and government entities need a better understanding of the legal issues surrounding takings, eminent domain and condemnation to require individuals to retreat.	• Need open space once retreat occurs as a buffer against future storms and coastal erosion because natural disasters will continue to impact coastlines.	• Need rebuilding restrictions to facilitate retreat and accommodation where appropriate. • Need to change insurance laws to accurately cover losses relative to coastal erosion flooding, sea level rise damage, chronic coastal hazard claims, etc.
Economic	• Resorts, hotels and condominiums along the shore provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue. • Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly. • Retreat is expensive and there are competing public needs for public funds.	• Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly through loans, grants, etc. • Urban areas provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue.	• Single-family homes along the shore provide tax revenue and is an income generator for the State and county and retreat will mean a loss of such revenue. • Retreat is expensive and there is not an understanding of who pays for the relocation of the single-family homes and how funds will be raised either privately or publicly.	• Retreat is expensive and there is not an understanding of who pays for the relocation of the facilities and infrastructure and how funds will be raised either privately or publicly through loans, grants, etc. For example, should there be a carbon tax or a reserve fund to pay for the true price of public services (e.g., amount of water we use) to fund necessary services like retreat?
Shoreline Management/ Public Access	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.	• Need assurance that vacated areas are not redeveloped after retreating from them. • If retreat is to occur, the result must end in having greater public access / recreation for all residents.	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.	• If retreat is to occur, the result must end in having greater public access / recreation for all residents.

Should managed retreat be determined to be the preferred adaptation strategy, the similar issues and concerns relevant to all Scenario Profiles (as shown in the above chart) may be distilled as follows:

- Economics – How may retreat be funded?
- Insurance – If and how insurance plays a role in retreat?
- Legal / Policy – How retreat is to be accomplished?
- Open Space / Public Access / Social Equity and Justice – How open space and public access to the coastlines may be preserved and how social equity and justice may be ensured?

The four predominant themes identified through the Scenario Profiles were used to select the panel topics for the Symposium and Hawai'i expert panelists to provide a better and more in-depth understanding of the subject matter relative to managed retreat.

B. Symposium Speakers And Panels

The Managed Retreat Symposium was an all-day event on January 11, 2018 hosted by the Office of Planning CZM at the Aloha Tower Marketplace. It continued assessing the feasibility of managed retreat as a strategy for climate change adaptation. This section of the Report summarizes information and perspectives raised by the two keynote speakers – one facilitating retreat after a catastrophic post-disaster event and another facilitating retreat from chronic coastal hazards – and the four expert Hawai'i panels.

The Symposium helped provide better understanding of the managed retreat programs, policies and tools being used elsewhere which might be considered in Hawai'i. It provided different industry perspectives (academia, government, finance, insurance, law and non-profit) on the opportunities and challenges for managed retreat. A video of the sessions is available on the CZM web site.

Keynote Speaker #1: Fawn McGee, New Jersey Department of Environmental Protection, Director of the Blue Acres Buyout Program

Project Overview – Catastrophic Post-Disaster Managed Retreat Program

The New Jersey Blue Acres Buyout Program was created with the passage of the Green Acres, Farmland, Historic Preservation and Blue Acres Bond Act of 1995. The voter-approved referendum allocated $15 million to the Blue Acres Buyout Program for grants and loans to acquire lands for recreation and conservation purposes in coastal areas that have been damaged by storms, that may be prone to storm damage or that buffer or protect other lands from storm damage. The New Jersey Blue Acres Buyout Program is administered by the New Jersey Department of Environmental Protection (NJDEP).

In 2013 after Superstorm Sandy, additional federal funding (financial assistance provided by federal public agencies) was allocated to buy out storm-damaged homes, with a goal of purchasing 1,300 homes from willing sellers. The Superstorm Sandy Blue Acres Buyout Program is part of a larger post-Superstorm Sandy resiliency plan, which also includes a comprehensive shoreline protection framework.

The Blue Acres Buyout Program has leveraged $375 million in federal and state funding from FEMA, HUD and state bonds and serves as a financial compensation mechanism to provide a pathway for property owners to relocate from their properties in high-risk areas to safer locations. The buyout program is designed to purchase clusters of homes from willing sellers who had repeated NFIP claims. The preference is to purchase clusters of homes where there is the opportunity for significant impact on the environment and public safety. These buyouts were completed with the support of local officials and provided the opportunity for significant beneficial impact on the environment and public safety. All homes were purchased at pre-storm values, and the buyout program also took responsibility for demolishing the structures and disposing of the waste. The process has not been a fast one – some sellers took longer to participate, waiting until their neighbors' homes were bought out and the character of the neighborhood started to change.

To date, approximately 969 homes have been approved for purchase, 621 have closed and 507 demolished. The average purchase price was $300,000 (including closing, demolition and waste disposal costs).

Once the properties were under state ownership, the program turned management over to county and local governments to decide how the land will be used and maintained. Most often land has been used for open space or ecological restoration purposes.

By leveraging multiple funding streams, the program was able to acquire a broader range of properties. Those that did not qualify for federal funding (i.e., second homes, contaminated sites) were able to be bought out using state funds. The program also worked with mortgage lenders to forgive mortgages that were "upside-down" (i.e., a mortgage in which the owner owes more than the house is worth).

Buy-in from local government, strong relationships with funding agencies, a consistent but flexible process, established procedures, compassionate case managers and a sense of humor were all identified as crucial components to the success of the program.

McGee attributes the program's success to the offers being at pre-disaster values, buy-in from local government, creating strong relationships with funding agencies, a consistent but flexible process and established procedures. The program was developed and implemented in-house versus using contractors, which built agency knowledge and capacity. Staff worked with mortgage lenders to help many owners with "upside down" mortgages to obtain debt forgiveness. On the human side, case managers were compassionate and had a good sense of humor which was an intangible but crucial component to success. The program has had permanent results.

Summary of Blue Acres' Salient Points and Applicability to Hawai'i:

- Purchasing homes at pre-disaster values (an average of $300,000 per property for both purchase and demolition) is a method of incentivizing retreat.
  - ⚠ The costs of purchasing shoreline real property in Hawai'i at pre-disaster value would be extremely high and substantially exceed $300,000 per property, including purchase, demolition and waste disposal.
- Case managers to address the "human-side" of retreat is necessary, such as assistance with removing the "upside down" mortgages impediment to relocating, validating the Background Research and Scenario Profiles' principle that there must be some level of community agreement, understanding and support for retreat.
- Strong cooperation with federal agencies, e.g., moving offices into the same building as federal agencies, and also interagency cooperation are necessary to facilitate retreat, again validating Background Research and Scenario Profiles' principle that there must be some level of community agreement, understanding and support for retreat.
- Buyout of homes need to occur in clusters to achieve maximum effect, validating Background Research's principle that communities should not be fractured.
- Areas bought out need to be kept as open space or for ecological restoration purposes, validating Background Research and Scenario Profiles' principle that open space must be preserved after retreat.
- Retreat project should not be outsourced to a consultant to develop built-in government agency knowledge and capacity.

Keynote Speaker #2: Stefanie Sekich-Quinn, Managed Shoreline Retreat at Surfer's Point, Ventura, California

Project Overview – Chronic Coastal Hazards Managed Retreat Effort

The managed shoreline retreat effort at Surfers' Point, Ventura, CA began in 1995 and is still ongoing. It involves retreating public facilities – parking lot, bike path, etc. – from a two mile stretch of a highly utilized but badly eroding shoreline.

Stefanie Sekich-Quinn presenting at the January 11, 2018 Managed Retreat Symposium

The project was a community-driven counter-response to an effort to harden the shoreline through armoring to protect facilities from coastal erosion. The area had already undergone coastal hardening without long-term success and was still experiencing severe shoreline erosion. This project aimed to demonstrate that natural amenities – such as the surf break and shoreline – and facilities can both be preserved by taking a managed retreat approach.

The project has been a 20-year effort and is still being implemented. This shoreline located in Ventura is highly used but quickly eroding. Preservation required stabilizing the beach using a cobblestone substrate covered with sand and dune vegetation. To do this, two public facilities, a large parking lot and a coastal bike path had to be removed and relocated. The land was owned by the county fairgrounds that relied upon the parking for its events. Without the parking, there could be no county fair, which was a huge draw for the area, and local government and residents did not want to lose the fair or parking grounds.

Funding came in stages. $1.2 million came from federal transportation enhancement program and state sources included earmarked tourism tax, a $.25 sales tax and bonds.

The project began with a working group made up of decision makers, residents, environmentalists, and other stakeholders which was formed to secure funding to replace the damaged bike path and parking lot.

Many stakeholders opposed the project at the outset; people could not see beyond their own narrow interests as to how retreat could have multiple benefits. Extensive public outreach and hundreds of meetings later, Ventura Surfrider Association and other groups were able to shift public perception and bring the key stakeholders into agreement.

Sekich-Quinn felt the project's successes included increasing public access to a world-famous surf break, stabilizing the beach to prevent further erosion, enhancing public facilities such as the county fairgrounds and finding better locations for the parking and bike path.

Sekich-Quinn named some of the many lessons learned: need an individual, group or agency to champion to retreat project; engage multiple local public interest groups; involve environmental permitting agencies; carefully consider the choice of materials to restore the shoreline; and have a pilot project to demonstrate how the methods proposed would work.

During this project, Ventura Surfrider Association aligned state and federal funding sponsors and advocated for new state funding sources. They were able to frame the project for its transportation benefits and park improvements, which was easier to get federal funding than the more esoteric "climate adaptation" and public access objectives. Final lessons were to be ready to distribute information with illustrations so people can see what you are doing and always respect the beach.

Summary of Surfer's Point's Salient Elements and Applicability to Hawai'i:

- Despite only trying to retreat a two mile stretch of public infrastructure onto (again) publicly owned property, the retreat process is taking over 20 years and still ongoing.
  - ⚠ The length of time – 20 years and counting – to retreat a relatively short – 2 miles – public works project is instructive of how difficult the retreat process truly is.
- For even a relatively modest public works project to succeed without the impetus of a catastrophic event, federal, state, county and non-profit interests must be aligned, validating the Background Research and Scenario Profiles' principle that there must be some level of community agreement, understanding and support for retreat.
- Obstacles such as people losing parking spaces almost caused this project to fail, which is a reminder that people will not always be able to see the big picture goals of a managed retreat project if personal interests are being threatened.
  - ⚠ For a planned managed retreat project in the face of chronic coastal hazards to succeed, the retreat project will need to benefit more than one constituent. For example, the project will need to be framed as having transportation and park improvement benefits other than just the esoteric "climate adaptation" and public access objectives, validating the Background Research and Scenario Profiles' principle that there must be some level of community agreement, understanding and support for retreat.
  - ⚠ Looking beyond "climate adaptation" or "managed retreat" will be crucial to a retreat project's success. The marketing of co-benefits of retreat, e.g., improved transportation, public access, and storm water runoff prevention, will help improve public perception and secure funding for a retreat project, validating the Background Research and Scenario Profiles' principle there must be some level of community agreement, understanding and support for retreat. A retreat project cannot just satisfy or fulfill one constituent's needs.
  - ⚠ Additionally, the Surfer's Point retreat project is a feat of coastal engineering using cobblestone substrate covered with sand and dune vegetation which may likely not be duplicated in Hawaii given the differences between Hawaii and California's geographic features.
  - ⚠ Coastal engineering for managed retreat to restore the surf break and beaches could impact, in Hawaii, surf breaks and may need additional beach re-nourishment.

Hawai'i Expert Panel One: Finance, Tax and Economics

Members: Dr. Paul Brewbaker, TZ Economics (sitting left)

Lea Hong, Trust for Public Lands (sitting right)

Tom Yamachika, Tax Foundation of Hawai'i (sitting middle)

Finance/tax/economics panelists discussing private versus public fiscal responsibility at the January 11, 2018 Managed Retreat Symposium

As identified in the Background Research and in the Scenario Profiles, funding is crucial to managed retreat. Managed retreat is an expensive proposition and will be an even more expensive project to achieve, given Hawaii's exorbitant and limited real estate. Panelists were asked to discuss the availability of public and/or private funds for retreat and impacts on the tax base, if any, if retreat were to occur.

Summary of Finance, Tax and Economics Panel's Salient Points:

- Hawai'i has limited options for funding retreat at the state and county level for long-range chronic coastal hazards. Mechanisms for raising funds include issuing government bonds, imposing new taxes or impact or user fees, which all can be highly controversial and politically difficult. There may be private conservation or open space grant funding to support managed retreat but these grant sources are limited, highly competitive and usually very narrowly defined in scope and therefore may not apply to retreat projects.
  - ⚠ Even if a bond is issued or taxes raised, Hawai'i has a poor track record when it comes to setting aside funds, as they tend to get appropriated for purposes other than what was originally intended. The feasibility of managed retreat will depend upon the ability of the Hawai'i legislature to properly allocate its current funding, while saving for the future.
  - ⚠ Hawaii's limited fiscal resources and poor track record of savings make it unlikely that the State could finance retreat on its own.
  - ⚠ There may be federal funds for retreat, especially in cases of catastrophic events through FEMA and/or HUD, but there may be state matching requirements which may be difficult for Hawai'i to contribute, given its poor fiscal record.

Summary of Finance, Tax and Economics Panel's Salient Points (continued):

- Coastal properties are some of the highest valued land in the State (DBEDT, 2016). Thus, managed retreat strategies that impact the value of coastal properties also have the potential to decrease the counties' property tax base, which may a problem, albeit temporary.
- Real estate market forces inflate the value of coastal properties but do not reflect the risks with commensurate insurance rates, which are subsidized by NFIP.
- There are differing viewpoints on the desire to protect private property versus purchasing someone's property for public safety, societal or environmental benefits.
  - ⚠ Equitable allocation of public money is an important consideration in determining how to use public funds to retreat private property. Will buyouts of residential coastal properties disproportionately benefit the wealthy who are able to purchase high value real estate along the shore?
- More clarity is needed around the government's role in buyouts of residential real property to facilitate retreat:
  - Defining public versus private fiscal responsibility.
  - Quantifying the fiscal burden of buyouts.
  - Setting realistic expectations for property owners expecting to be bought out.
  - Defining income / residence / insurance requirements to qualify for buyouts.
  - Valuing properties for buyouts.
  - Creating a financially sustainable buyout model that can be consistently applied.
  - Understanding the legal ramifications of management of the coastal area and makai (oceanside) of the upper reaches of the upper washes of the waves, which are public trust lands under the Hawai'i Constitution. Hawaii's shores must be managed under the precautionary public trust principle, meaning the government must consider itself a trustee of the coastal area and must act with diligence and care like a fiduciary in ensuring that "traditional and customary Hawaiian rights, wildlife, maintenance of ecological balance and scenic beauty, and the preservation and enhancement of the water for various uses in the public interest" are protected (*Waiāhole Ditch* Case, 2000).

Hawai'i Expert Panel Two: Insurance

Members: Wesley Brum, First Insurance Company (sitting right)

Sue Savio, Hawai'i Insurance Associates (sitting left)

Insurance panelists discussing the challenges of managed retreat at the January 11, 2018 Managed Retreat Symposium

The Background Research and Scenario Profiles identified insurance as a central point of confusion for the analysis of the feasibility of managed retreat. The Background Research indicated that insurance, through the National Flood Insurance Program (NFIP) incentivizes development of projects in risky lowland, inland flood prone areas and permits developments to also occur along the coast by having the government subsidize insurance, making policies affordable and not reflective of the true costs of coastal living. Further, there was a lack of understanding of whether the insurance sector had any obligation to fund owners' retreat due to repeated flooding or coastal erosion issues. Panelists were asked to address the insurance industry's role in retreat.

Summary of Insurance Panel's Salient Points:

- FEMA's NFIP makes it possible for homeowners to obtain affordable flood insurance within vulnerable coastal areas, which is required for mortgages. The private insurance industry already excludes flooding and water damage from most policies or charges a very high premium, reflecting the true cost of coastal living.
  - ⚠ The implication is that without the ability to secure flood insurance via NFIP, it would be difficult or impossible to secure a mortgage.
  - ⚠ The implication is that without the ability to secure flood insurance via NFIP, owners would have to purchase insurance that truly reflects the costs of coastal living or take the risk of living along the shore without insurance or be prevented from purchasing or obtaining a mortgage for coastal properties.

Summary of Insurance Panel's Salient Points (continued):

- Insurance policies are written on the homes and not on the parcels of land themselves. Therefore, insurance policies are designed to provide replacement cost compensation to allow the homeowner to rebuild or repair a specific structure on a specific piece of property.
  - ⚠ If a property owner decides to not rebuild on the lot, then they are entitled to diminution in value of the insured property only and the owner may purchase another home elsewhere with the reduced funds received. It will require legislative action to mandate insurance companies to compensate at the full value of the policy even if the policyholder decides not to rebuild in place but retreat.
  - ⚠ It is not the insurance industry's role to influence the decisions of property owners or tell them how or where to rebuild or to promote retreat. The insurance industry is a profit-driven industry and if the industry is making a profit, it will continue business as usual practices.
- FEMA is charged with administering federal programs for flood insurance. The FEMA-issued Flood Insurance Rate Maps (FIRMs) identify flood hazard areas that provide the basis for the subsidies issued by NFIP. FIRMs' hazard areas are based on historical flooding patterns and do not consider projections of SLR and other climate change related impacts.
  - ⚠ If FEMA is going to take steps to update FIRM designations and increase NFIP rates to more accurately reflect coastal risks, Congressional action will be required.
  - ⚠ NFIP's Community Rating System (CRS) supports greater community resilience through reducing insurance rates for communities that exceed minimum NFIP standards. However, many of these standards encourage protection or accommodation measures in vulnerable areas rather than retreat. As of 2018, Maui and Hawaii Counties are members of the CRS Program.

Hawai'i Expert Panel Three: Legal and Policy

Members: Doug Codiga,
Schlack Ito (middle)

Gregory Kugle,
Damon, Key Leong Kupchak,
Hastert (left)

Mike Kozak,
Attorney at Law (right)

Legal/policy panelist discussing the challenges of managed retreat at the January 11, 2018 Managed Retreat Symposium

The Background Research and Scenario Profiles indicated that legal and policy issues impacting managed retreat were areas in need of further examination. The role of government needs to be clarified regarding retreat, especially with constitutional takings and public use issues. Further, government needs to decide whether to promote retreat, accommodation and/or protection strategies and under which circumstances. Panelists were asked to address whether the law supports retreat and the government's role in retreat, accommodation and/or protection strategies.

Summary of Legal / Policy Panel's Salient Points:

- A well-defined legal definition of managed retreat is lacking. Hawai'i needs a statutory and long-term planning and policy framework to implement managed retreat and under what circumstances retreat should occur versus accommodation and/or protection.
- Hawai'i, from county to county, lacks a uniform and consistent set of coastal development regulations. These include the State Land Use Districts, Special Management Areas (SMA), shoreline setbacks, subdivision ordinances and building codes. The way regulations are interpreted and enforced may vary from county to county and agency to agency.
  - ⚠ However, counties have the ability to establish more stringent coastal development regulations as their coastal erosion maps dictate.
  - ⚠ For some property owners, due to the complexity and cost of the permitting systems at the county and State levels, they wait for coastal erosion damage to become a threat to life, safety and property before taking action to shorten the processing timeline, which is a contradictory and counterproductive goal of the shoreline permitting system.

Summary of Legal / Policy Panel's Salient Points (continued):

- ⚠ Pursuant to Attorney General Opinion (AG Op.) No. 17-1, the State owns all lands toward the sea from "the upper reaches of the wash of waves, usually evidenced by the edge of vegetation or by the line of debris left by the wash of waves." This is known as the shoreline and a certification will need to be prepared of the shoreline to ascertain the upper washes of the waves. With coastal erosion and sea level rise, the shoreline may move inland, providing the State with more land and private owners with less property. AG Op. No. 17-1 may give rise to jurisdictional issues between the State and counties for shoreline permitting matters, lengthening the process for private owners. Ultimately, the validity of AG Op. No. 17-1 will be decided by the courts.

- From a private property owner's perspective, the intent of the Fifth Amendment to the U.S. Constitution is that private property owners should not bear the cost of a public burden, meaning the eroding shoreline. Possible tools to facilitate retreat include eminent domain (the government's legal authority to take private property with just compensation), voluntary buyouts and relocation, and transfer of development rights (owner still owns the land but can no longer develop the land and is permitted to develop elsewhere). Compensation for property owners will have to be discussed in a long-term managed retreat strategy.
  - ⚠ However, public sentiment is against buying out private, wealthy property owners at taxpayer expense.
  - ⚠ The U.S. and Hawai'i Constitutions require that if the government is to acquire property, then it must be for just compensation, which may be unrealistic and fiscally unsustainable if the metric is fair market value for coastal properties.
  - ⚠ Further, U.S. and Hawai'i Constitutions require that if the government is to acquire property, then it must be for "public use", which may be difficult to ascertain as to what constitutes a "public use" for the purchased properties if there are no plans for them.
- In addition to long-term planning, there are regulatory / legal measures the government should look at to affect the coastal landscape.
  - ➢ Mandatory sea level rise and coastal hazards disclosure requirements should be enacted for sales and purchases of coastal properties.
  - ➢ Shoreline setbacks should be increased.
  - ➢ Actions against illegal shoreline armoring should be enforced.
  - ➢ A definite position on whether or not to issue armoring permits and variances should be adopted by counties and the State.

Hawai'i Expert Panel Four: Open Space, Public Access and Social Justice

Members: Doug Cole, North Shore Land Trust (middle)

Dr. Danielle Spirandelli, University of Hawai'i at Mānoa (right)

Ramsay Taum, PBR Hawai'i (left)

Panelists at the January 11, 2018 Managed Retreat Symposium discussing the public access, open space, and social justice considerations of managed retreat

The Background Research and Scenario Profiles indicated that managed retreat implicates the issues of open space, public access and social justice and these areas cannot be forgotten when retreat is considered. Open space and public access must be considered when planning for retreat, as they protect areas and increase the resiliency of areas that need to be and are ultimately retreated. Further, there are immense social justice issues surrounding retreat, given the costs of retreat and the various governmental competing priorities. Panelists were asked to address the issues of open space, public access and social justice pertaining to retreat and whether they may be reconciled.

Summary of Open Space, Public Access and Social Justice Panel's Salient Points:

- In prioritizing areas for adaptation strategies, there is a tendency to focus attention and resources on areas with high value assets, particularly those in densely populated urban areas.
- Social equity factors should be specifically identified and considered as part of a climate adaptation strategy that includes managed retreat. This includes assessing the potential impacts of sea level rise on residents and businesses as well as access to housing, social services, shelters, medical facilities, transportation facilities, parks, schools and critical public services and facilities.
- The ability for managed retreat and other climate adaptation strategies to address the needs of various stakeholders and communities, including the most vulnerable, will greatly impact its success.

Summary of Open Space, Public Access and Social Justice Panel's Salient Points (continued):

- Managed retreat presents an opportunity to enhance public access and open space for certain shoreline areas by expanding publicly owned areas along the coast. Parks may double as flood retention areas or be used as wetland walkways and wildlife preserves.
  - ⚠ Creating and maintaining public access and open space areas are not without challenges, such as loss of county tax property tax revenue and residents having to relocate their established communities. This may be an opportunity to utilize retreat to achieve multiple public benefits, such as enhancing communities and developing innovative public-private partnerships for funding, management and maintenance of new public spaces.
  - ⚠ Shifting development out of coastal lands into inland areas will likely mean increasing development pressure on areas designated for agriculture or open space. Open space is an important component to quality of life, as well as a critical asset for preserving scenic views and access to Hawaii's natural beauty. Agriculture is a valued part of the State's economic livelihood, as well as an important component of Hawaii's goals of sustainability and food self-sufficiency. Balancing these values against the need to accommodate displaced coastal people and development will be critical in advancing climate adaptation and managed retreat.
  - ⚠ Developing inland areas to retreat to may have adverse environmental impacts, as many inland areas have sensitive resources including critical habitat and endangered species.
- Movement of communities to inland areas may result in alterations to the character of neighborhoods. Existing inland communities will need to be involved in the conversation on how to accommodate their displaced neighbors while also simultaneously preserving the qualities of existing neighborhoods and the communities being retreated.
- Hawai'i currently has an "ownership" view towards natural resources. There is value in shifting the lens (or rather shifting back to a Native Hawaiian lens) to view our relationship with nature as one of kinship, i.e., thinking of "resources as relatives." Along with important Hawaiian historical and cultural resources – iwi kupuna (ancestral remains), heiau (temple or sacred site), ko'a (fishing grounds or shrines along the shoreline), hale (homes), etc. – traditional and customary rights of Native Hawaiians, including fishing and other shoreline activities, must be preserved and protected.

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CHAPTER 4: ASSESSMENT OF THE FEASIBILITY OF MANAGED RETREAT IN HAWAIʻI

Chapter 4 presents the Project findings and makes recommendations for next steps. The Project findings and next step recommendations were gleaned from the Background Research, Scenario Profiles and the Symposium.

It bears repeating that retreat is one of three main adaptation strategies along with accommodation and protection. Thus, prior to deciding upon retreat, accommodation and protection must be examined to determine which strategy is the best for the area dealing with coastal hazards, climate change and sea level rise. If retreat is pursued, the area retreated from has considerable potential for enhanced public access. Therefore, the bookends of any managed retreat project are first determining if retreat is the correct strategy to develop for the area and if yes, then the retreat project should end with the area retreated from enhancing public access to the shore, as discussed below.

This report is merely a beginning assessment of the feasibility of managed retreat in Hawaiʻi. Consideration of the various next steps should be taken to develop a better, more thorough understanding of managed retreat in Hawaiʻi and how retreat varies by location and development type. Presently, there is a realization that retreat is a necessary adaptation strategy in Hawaiʻi along with accommodation and protection but the question remains how to implement retreat and under what circumstances.

At the outset of the Project, there was a desire or thought to developing a step-by-step checklist for practitioners to implement managed retreat from coastal areas threatened by sea level rise and chronic erosion. As research progressed, it quickly became evident that managed retreat was too complex of an area and too cross-jurisdictional – planning, legal, insurance, economics, tax, equity, etc. – at this stage to develop a one-size-fit-all plan to implement managed retreat.

A. PROJECT FINDINGS ANSWERING THE KEY QUESTIONS FOR MANAGED RETREAT

A wide range of existing retreat programs was examined in the Background Research, leading to overarching themes being identified for a successful retreat project. The themes were used to facilitate Hawaiʻi Scenario Profiles to assess the feasibility of managed retreat from vulnerable coastal areas for resorts/hotels/condominiums, single family homes, urban areas and infrastructure. The information gathered from the Background Research and Scenario Profiles were further distilled to a day-long Symposium to discuss with mainland and local experts to gather useful tips applicable to Hawaiʻi.

The synthesis of the Background Research, Scenario Profiles and Symposium in this Project yielded the below findings (listed in no particular order) pertinent to assessing the feasibility of

managed retreat in Hawai'i once retreat is determined to be the path to proceed versus accommodation and/or protection. The below findings also aligned with the key questions raised at the outset for managed retreat set forth in Chapter 1, Section F.

Key Question: What criteria should be used to determine when to retreat and what are the priorities for retreat?

- **Community Agreement / Understanding** – The community must have some level of agreement, understanding and support for retreat. Retreat programs have proven more successful when they are voluntary. A managed retreat scheme will have limited success and be more prolonged in effort and expense if it is imposed or mandated by government – either state or county – against the desires of the people.
- **Retreat Should Use a Local / Regional Approach** – Along with having some level of community agreement, understanding and/or support for retreat, the area to be retreated (versus accommodated and/or protected) should be determined locally. The community should arrive at the decision to support retreat and should decide what areas are to be retreated. For example, the community should arrive at some agreement as to whether it wants to focus on retreating critical infrastructure versus private property and what standards it applies to selecting the areas to be retreated.
- **Retreat Should Not Result in Fractured Communities** – If communities are fragmented, this will not support the united social and positive psychological factors necessary for a successful retreat. Further, fractured and divided communities will increase the costs for governmental services to the newly retreated community and the remaining fragmented communities.

Key Question: What are the monetary costs for retreat and tax implications of treat and who should be responsible for shouldering the financial burden of retreat?

- **Catastrophic Events Result in a Greater Impetus for Retreat** – It appears that when there is a catastrophic event, there is more of an impetus for government to act to retreat a community with attendant funding and resources available from the federal and state governments to implement retreat.
  - **Retreat Is Only One Adaptation Option** – When catastrophic events occur and retreat is being considered, it needs to be repeated, that retreat is just one adaptation method to climate change, coastal hazards and sea level rise. The others are accommodation (examples are flood-proofing and elevation) and protection (examples are seawalls, revetments, sediment management and dune restoration and beach re-nourishment). Retreat should be considered in context with other approaches and following a careful analysis of benefits and costs that address the stated program objectives.
  - **Buyouts to Facilitate Retreat Are Problematic** – While funding is more readily available for retreat after a catastrophic event, if buyouts of public properties are being considered, then it must be kept in mind that buyouts are extremely problematic. Buyouts for retreat as shown in this report are usually at pre-

disaster, fair market value. The cost of land and real estate in Hawai'i may make widespread use of buyouts at pre-disaster, fair market value impossible. Further, the Symposium highlighted the skepticism of buyouts of coastal private property by the government. Ability to pay and willingness to pay (i.e., who pays – government versus private) will be enormous barriers to including large-scale buyouts in a retreat program.

- **Chronic Coastal Hazards Result in Less of a Catalyst for Retreat** – It appears that chronic coastal hazards result in less of a demand or stimulus for retreat.
  - **Retreat from chronic coastal hazards may take decades to implement** – A managed retreat program will require a commitment over many decades to implement – even a relatively minor public works project to move a bike path and parking lot, i.e., the Surfer's Point project (described in Chapter 3, Section B). When to implement managed retreat, after or before a disaster, impacts how people perceive the importance of retreat and their willingness to participate. The near in time it is to the memory of a disaster, the greater the sense of urgency, and the more likely to have progress. Having said that, the time for public education, community involvement, planning, and arranging for response tools best occurs prior to and when not in the midst of responding to a crisis.
  - **The political will to implement retreat is difficult to find absent a catastrophic event** – The political process determines how priorities are sorted among competing needs: education, public welfare, homelessness, police and fire protection, transportation and more. Raising new taxes can be difficult, and the competition for general fund revenues is fierce. Even if new taxes are enacted and collected, it is not certain that the monies will be spent on managed retreat priorities. Further, the political will to fund retreat may be lessened upon understanding that the tax base will be reduced by loss of valuable coastal properties being retreated inland.
- **Funding Mechanisms Will Have To Be instituted by the Government for Retreat to Occur** – Whether taxes are raised or bonds are floated, government will have to raise monies for there to be retreat. Funding is needed for staffing and program overhead, to conduct public education and outreach, to plan, to implement programs to facilitate retreat and to prevent further development in hazardous areas. If the retreat program involves financial incentives or buyout, considerably larger amounts of funding are needed, in the millions or billions of dollars, over many years. Having a funded program demonstrates commitment which can be leveraged to obtain money from others. There may never be enough money for a statewide buyout program but it may be possible in selective cases.

Key Question: Where are the available lands by State and county land use to retreat to?

- **State and County Long-Range Plans Must Provide for Managed Retreat** – State and county long-range plans guide decision-making about what uses are permitted in and around the shoreline and what land use patterns and densities are necessary to accommodate projected demographic and environmental changes. Long-range plans address the siting and management of critical infrastructure, public services and facilities,

and natural resources and ecosystems. Thus, State and county's long-range plans will need to account for managed retreat if retreat is to be properly implemented.

- **State and County Land Use Must Also Determine Where It Is Possible to Retreat To** – Included in updating State and county long-range plans to consider retreat is a review of State and county land use to determine where it may be possible, meaning where there is available land, given competing priorities such as agricultural production, conservation holdings, open space, military uses, etc. to retreat inland.
  - **Land in Hawai'i to Retreat to is Limited** – The availability of State land to provide a suitable location for development to retreat to is limited. The amount of land available and ready to be developed may not be sufficient to the need. Land ownership patterns and high land values are obstacles and environmentally sensitive inland areas are limitations to development. Thus, lot size and density would have to be addressed.
  - **State and County Long-Range Plans Must Determine Relocation / Retreat of Critical Infrastructure** – The coastal roads that rim every island are often the sole means of access in and out of a community or neighborhood. Aging and protected by seawalls that are failing, many roadways may need to be relocated. With the roads come utilities, as well as linkages to communications and other critical infrastructure. This may be among the most difficult sea level rise challenge of all for the public sector. In many locations, there is no place to move mauka (inland) without going through a mountain or purchasing hundreds of homes and businesses to form a new roadway. This will greatly increase the environmental, permitting and cost requirements to the point where it may be impossible to build new roads using current processes. It may be financially out of reach to implement widespread retreat of roads under these existing conditions.
  - **Areas Retreated From Should Be Left as Open Space for a Resilient Coastline** – Retreated properties should be used to create or restore shorelines, including dune systems, wetlands, floodable open space and/or storm water management systems, for a more resilient coastline that would provide a buffer against future storms and coastal erosion.

Key Question: What are the myriad of legal issues surrounding retreat?

- **Political and Legal Action Will Be Needed To Facilitate Retreat After A Catastrophic Event And In Response to Chronic Conditions** – New laws will need to be adopted to implement and facilitate retreat. Shoreline setbacks may be increased, coastal armoring may be prohibited (except in very limited circumstances) and rebuilding restrictions may need to be enacted to facilitate retreat. There may be real estate disclosure requirements for properties sold along the coast. Additionally, legal mechanisms, e.g., transfer of development rights, conservation easements, rolling easements, etc., must be examined for effectiveness in promoting retreat and then adopted / implemented if useful.

B. ENHANCED PUBLIC ACCESS RESULTING FROM RETREAT

As identified in this Report, a potential benefit of managed retreat is to provide enhanced public access to the shoreline. The State of Hawai'i has laws protecting the right of the public to access the shoreline. As the Hawai'i Supreme Court has stated, "[o]ur examination of the relevant legal developments in Hawaiian history leads us to the conclusion that the western concept of exclusivity is not universally applicable in Hawai'i" (*PASH*, 1995).

Public shoreline access is under threat with rising sea levels and in combination with other coastal hazards. Shoreline hardening and armoring, such as seawalls, also threaten to further exacerbate beach loss. Simply put by Spence Campbell, national staff member from the Surfrider Foundation, "If there's no beach, there's no beach access" (Surfrider Interview, May 20, 2017). Thus, there is strong nexus between coastal development and the public's access to the shoreline for recreation, traditional practices and other purposes.

Managed retreat has the potential for increasing shoreline access to some areas in Hawai'i. This can be seen as an opportunity to enhance shoreline access for recreation, cultural practices, subsistence, and coastal safety. Coastal wetlands, dunes, and parkland can serve as a natural buffer zone to mitigate the impacts of natural hazards to inland development (Herrington, 2001). As hazardous zones have been increasingly developed across the U.S., these buffer zones have been lost in some areas. However, in some cases, managed retreat has provided the opportunity to create public open space along the coast while providing the co-benefit of restoring coastal ecosystems and providing a natural buffer to coastal hazards.

As previously mentioned, following Superstorm Sandy in 2013, federal funding was allocated to the NJDEP Superstorm Sandy Blue Acres Buyout Program to buy out storm-damaged homes. Once the properties are purchased and demolished, the program turns their management over to county and local governments to decide how the land will be used and maintained; most often this land has been used for public purposes. This has also led to efforts to restore the land in certain locations to its original wetland ecosystem. This allows for the land to absorb flood waters and reduce the need for future disaster assistance by police, fire, emergency crews and other first responders (F. McGee, Symposium, January 11, 2018). In a related buyout effort, the NJDEP Blue Acres Program and the U.S. Department of Agriculture's Natural Resource Conservation Service are partnering to buy and preserve as open space the Bay Point section of Cumberland County's Lawrence Township, including 33 homes (NJDEP Website, 2018). This land will be converted to open space that will provide wildlife habitat and buffers against future flooding (NJDEP Website, 2018).

Image: Before image taken in 1995 of Phase 1 of the Managed Retreat Shoreline Project at Surfers' Point, Ventura, CA (Credit: Paul Jenkin).

The managed shoreline retreat project at Surfer's Point, Ventura, CA is also illustrative of the opportunities for managed retreat to increase public access and enhance access to recreational opportunities, while providing resilient infrastructure. The Surfer's Point managed retreat project involved retreating public facilities from a two mile stretch of shoreline over a 20-year period. In addition to stabilizing the beach to prevent further erosion and enhancing public facilities, this project's successes included increasing public access to a world-famous surf break. Had the county taken the conventional approach of armoring the threatened facilities in 1995 (when the project began), access to the shoreline and the surf break would have likely been curtailed (S. Quinn, Symposium, January 11, 2018). This project not only prevented further shoreline erosion but was used to widen the beach. Additionally, the project increased the amount of parking and provided a bike path more extensive than the original. The transformation of Surfers' Point that resulted from this project can be seen in the images on the previous and current pages.

It is important to note that the beach sand at Surfers' Point was replenished and restored through innovative coastal engineering. The managed retreat of the parking lot structure allowed the beach to migrate, perpetuating its ability to seasonally fluctuate and replenish sand stores. This is still a coastal engineering feat and maintenance of the beach may be required in perpetuity.

Image: After image taken in 2015 of Phase 1 of the Managed Retreat Shoreline Project at Surfers' Point, Ventura, CA (Credit: Paul Jenkin).

As a local example, following the 1960 tsunami in Hilo, the area along the bayfront between Kamehameha Avenue and the ocean was re-designated as a buffer zone where no businesses could be built (Miller, 2011). Any remaining businesses were condemned and torn down, and trees were planted in the area to absorb the energy of future tsunamis (Miller, 2011). This area, now known as Hilo Bayfront Park, has since expanded and continues to serve as a natural buffer between future tsunamis and downtown Hilo (Miller, 2011). During the 2018

Hurricane Lane event, Hilo Bayfront Park acted as floodable open space. Hilo Bayfront Park was the area that retreated from after the 1960 Tsunami and left as an open space, protecting nearby residential and commercial areas (Drive to Hilo, 2018). In addition to its hazard mitigation benefits, Hilo Bayfront Park also provides shoreline access and recreational opportunities to Hilo residents and visiting tourists.

C. Next Steps To Develop A Managed Retreat Plan

The review has thus far identified the commonalities to established managed retreat projects either necessitated by a catastrophic event or by chronic coastal hazards. The commonalities indicate that managed retreat is more likely after a catastrophic event when monies and resources and resulting political and social will to relocate are more plentiful and urgent. However, to have a cogent and comprehensive retreat plan, it requires long-range planning, legal changes, funding and some level of community agreement, understanding and support for retreat.

It is recognized that there is enormous interest in this Project and the recommendations contained herein, given the acute coastal erosion occurring statewide. Even knowing the urgency to act on retreat, there is an understanding that it is not an easy solution to implement, as evidenced by the Background Research, Scenario Profiles and Symposium. To rush haphazardly into retreat may waste precious and limited State, county and public sources of funds and lands and cause undesirable litigation. There has not yet been an agreement / consensus reached of what needs to be retreated, where to retreat to and how much it will cost. Currently, there are many State and county priorities – homelessness, food sustainability, energy neutrality, etc. – that strain resources. Thus, a more thorough, detailed understanding of retreat and what it entails is necessary. To act on retreat without a clear, deliberate plan may derail retreat in the long-run to the severe and irreversible detriment of the State, its precious, natural resources and citizens.

Therefore, the Report recommends convening a multiprong statewide leadership committee through the ORMP framework with subject matter expertise in (1) social science, (2) coastal hazards, (3) economics / tax, (4) legal / land use, and (5) planning. Additional subject matter expertise may be sought to inform the ORMP leadership committee to devise a comprehensive, cohesive managed retreat plan with identified implementable pilot projects at the end of its limited term.

The ORMP leadership committee will need to achieve State consensus as to a managed retreat vision and also work with counties and local individuals to formulate a retreat strategy. Managed retreat needs to be concurrently a State led effort with equal amounts of community agreement, understanding and support. As this Report has shown, without intra-government understanding as to what retreat entails and then at least some level of community comfort with the idea of retreat, managed retreat's success is not assured. Simultaneously, the State also needs to take a leadership role in retreat efforts, given its enormous resources. The ORMP leadership committee will provide its recommendations for a retreat plan to the Legislature, counties and public.

With the subject matter experts, a ORMP leadership committee may:

- Determine the feasibility and implications of additional managed retreat "tools" such as transfer of development rights (TDRs) and rolling easements by identifying successful implementation nationally and internationally.

- Establish criteria for areas to be retreat and priority list(s), knowing that the entire coastline for the State cannot be retreated. For example, LA SAFE has established a criterion for retreat. The ORMP leadership committee should also determine if different areas – condominiums, single-family homes, critical infrastructure, etc. – should have different retreat criteria. The ORMP leadership committee should also decide if one area is to be retreated first versus another area, e.g., legacy beaches to be retreated first versus critical infrastructure. If it is indeed legacy beaches that should be retreated first, then the ORMP leadership committee should determine which beaches should be prioritized for retreat and reasons for the priority list.
- Identify funding to retreat areas and review tax implications of retreat. The ORMP leadership committee should also determine how retreat is to be funded, i.e., by special tax districts or bonds or grants. Or, is there some other mechanism to fund retreat? The ORMP leadership committee should determine if retreat impacts the tax revenues for the State and counties.
- Review State and county land use to determine where it may be possible to retreat to.
- Review State and county plans to determine where they may be amended / updated to support retreat.
- Review laws and regulations that may have to be amended / adopted to facilitate retreat at the State and/or county levels. This includes examining, by the ORMP leadership committee, rebuilding regulations, setback changes, armoring regulations, rolling easements, transfer of development rights, etc.
- Outreach to communities to obtain their input and buy-in for retreat strategies to be adopted. This includes discussing with communities the tipping points for causing people to retreat, valuation of property for buyouts, level of government relocation assistance for retreat, etc.

The reason for a ORMP leadership committee is for uniformity of recommendations. If each necessary component of a managed retreat strategy / framework was designed separately, then there would be a lack of cohesion in the design of a multi-disciplinary framework, requiring State interagency coordination and coordination with counties and the federal government. Such a patchwork plan would likely not be viable.

GLOSSARY OF TERMS

Armoring Restrictions

Armoring Restrictions are policies and regulations govern the ability of private landowners to install shoreline armoring solutions as well as other hard adaptation protection measures that could cause increased erosion to neighboring properties. HRS § 205A-2(c)(9)(B) "prohibit[s] the construction of private erosion-protection structures seaward of the shoreline, except when they result in improved aesthetic and engineering solutions to erosion at the sites and do not interfere with existing recreational and waterline activities". Pursuant to Part III of Hawaii Revised Statutes (HRS) Chapter 205A, structures are prohibited, including shoreline hardening structures such as seawalls, revetments or other erosion control structures or devices in the shoreline area without a variance. "Shoreline area" is all of the land between the shoreline and the shoreline setback line and may include the area between mean sea level and the shoreline. HRS § 205A-41. A variance may be granted to allow for the construction of a shoreline hardening structure that will artificially fix the shoreline provided that the county authority finds that shoreline erosion is likely to cause hardship to the applicant if the subject structure is not allowed within the shoreline area, and the authority imposes conditions to prohibit any structure seaward of the existing shoreline, unless it is clearly in the public interest. HRS § 205A-46. Structures, including seawalls, revetments and groins, located seaward of the shoreline are under the jurisdiction of the State Department of Land and Natural Resources (DLNR), and need a conservation district use permit (CDUP) from the DLNR for construction and reconstruction pursuant to HRS Chapter 183C and Hawaii Administrative Rules Chapter 13-5. As structures may be built in special management areas in shoreline setbacks, the counties, as authorized by HRS Chapter 205A, administer special management area permits and shoreline setbacks. Each county has its administrative rules or ordinances to administer SMA permits and shoreline setbacks within respective county's jurisdiction.

Buyouts

Buyouts are a financial compensation mechanism to provide a pathway for property owners to relocate from their properties in high-risk areas and more to safer locations. Buyout programs are typically funded by Federal or State dollars and managed at the State or County levels (Freudenberg et al., 2016). In post-disaster mitigation efforts, buyout programs are funded through the Federal Emergency Management Agency (FEMA)'s Hazard Mitigation Grant Program (HMGP) and HUD's Community Development Block Grant (CDBG) Program.

Conservation Easements

Conservation Easements are voluntary legal agreements between a landowner and organization restricting specific activities on a property to protect land from future development. Conservation easements are binding on all future owners for the duration of the negotiated easement, often in perpetuity.

Community Development Block Grants

The Federal Department of Housing and Urban Development (HUD)'s Community Development Block Grants (CDBG) are administered for disaster recovery directly to States, local and tribal

governments, which have a high degree of discretion over how to use the money. These grants are the most flexible form of Federal funding, however, U.S. Department of Housing and Urban Development (HUD) can tie the grants to certain investment criteria that enhance resilience in pursuit of certain goals, such as managed retreat.

Hazard Mitigation Grant Program (HMGP)

HMG's purpose is to reduce future risk by including mitigation practices in rebuilding after a disaster. FEMA funds buyouts of property at risk of flooding through the HMGP. Grants can be used to voluntarily acquire, demolish or relocate threatened properties. HMGP may further consider managed retreat as a post-disaster measure to reduce the future risk of loss of life and property.

Land/Density Swaps

Land or density swaps are a mechanism to secure lands while compensating property owners in-kind through providing land or development rights. Land or density swaps can provide a partial or full replacement to financial compensation.

Managed Retreat

'Managed' is the purposeful action and plans to implement and monitor projects; and 'retreat' or 'realignment' refers to the repositioning of the shoreline (Esteves, 2014). Managed retreat can occur as a precautionary measure to avoid coastal threats, or it may also be used following natural disasters.

Mandatory Real Estate Disclosures

Mandatory real estate disclosures require a property seller to provide certain information before they sell a property. Mandatory real disclosures exist in Hawai'i, but its uses are limited. Under HRS § 508D-2, real estate disclosures apply to the re-sale of residential real properties. Under HRS § 508D-15, property sellers are required to disclose certain hazards of the property.

National Flood Insurance Program (NFIP)

NFIP is a federal program that enables property owners in participating communities to purchase flood insurance as protection against flood losses, while requiring state and local governments to enforce floodplain management ordinances that aim to reduce future flood damage. Residents and business owners who own property in high-risk areas are required to purchase flood insurance if they have a mortgage from a federally regulated or insured lender.

Rebuilding Restrictions

Rebuilding restrictions impose conditions or requirements on where and how rebuilding is permitted following a disaster or incident. Some require that damaged structures be replaced by more resilient structures, be built at higher elevations or be moved further from the coast. Others require that property owners agree to certain conditions before they can rebuild structures. Owners might be asked to agree not to build protective armoring, to purchase insurance, to remove structures when threatened by erosion or inundation or to be limited in the number of times they can rebuild. Establishing rebuilding restrictions can affect decisions regarding whether

to rebuild after flooding or natural disasters, but they can also make it possible for people to stay in shoreline areas longer if they invest in rebuilding more resilient structures.

Rolling Easements

Rolling easements are a set of land use policies and regulations that work together to promote efforts to migrate inward. Generally passed through State legislative action, rolling easements affect types of land (e.g., coastal) rather than being site specific.

Sea Level Rise Exposure Area (SLR-XA)

A sea level rise exposure area (SLR-XA) is the projected extent of chronic flooding due to sea level rise. SLR-XA was defined by combining the footprint of the following hazards: passive "bathtub" flooding; annual high wave flooding; and coastal erosion (Climate Commission, 2017).

State Land Use

All lands in Hawai'i are classified into one of four land use districts: Urban; Rural; Agricultural; or Conservation. The State Land Use Law (Chapter 205, Hawai'i Revised Statutes) establishes an overall framework for land use management in Hawai'i.

Subdivision Ordinances

Subdivision (and subdivided lands) means any land which is divided or is proposed to be divided for disposition into two or more lots, parcels, units or interests and also includes any land whether contiguous or not if two or more lots, parcels, units or interests are offered as a part of a common promotional plan of advertising and sale (HRS § 484-1). Each county has a Subdivision Ordinance that defines standards and requirements for the subdivision of land to ensure it is consistent with the County General Plan and Zoning Ordinance. In certain State Land Use Districts, there are additional regulations applied to the subdivision of land. For example, in evaluating the merits of a proposed land use within the conservation district, criteria are applied, including: "Subdivision of land will not be utilized to increase the intensity of land uses in the conservation district" ((HRS §13-5-30(b)).

Transfer of Development Rights (TDR)

Transfer of development rights (TDR) programs allow developers to purchase development rights from property owners in areas where development is not permitted or desirable and transfer those development rights to their own property. The transaction conserves land where the rights were sold and allow developers to use their purchased rights or credits to off-set variances (for example, increased floor area ratio, increased building height, etc.).

Upside Down Mortgage

Real estate loans and borrowers with negative equity on a real estate asset are said to be "upside down." In the owner-occupied housing market, a fall in the market value of a mortgaged property is the usual cause of negative equity. If the borrower defaults, repossession and sale of the property by the lender will not raise enough cash to repay the amount outstanding, and the borrower will still be in debt as well as having lost the property.

User Fees

A user fee is a fee or tax paid to a facility owner or operator by a facility user as a condition for using the facility.

HAWAIIAN WORDS AND PHRASES

Definitions for the Hawaiian words and phrases used in this document were sourced from Nā Puke Wehewehe ʻŌlelo Hawaiʻi (Wehewehe.org).

Ahupuaʻa

Land division usually extending from the uplands to the sea, so called because the boundary was marked by a heap (ahu) of stones surmounted by an image of a pig (puaʻa), or because a pig or other tribute was laid on the altar as tax to the chief. The landlord or owner of an ahupuaʻa can be called a konohiki.

Iwi kupuna

Bones (of deceased Native Hawaiians).

Makai

Towards the ocean (kai).

Mauka

Towards the mountains, or inland.

Pono

Goodness, uprightness, morality, moral qualities, correct or proper procedure, excellence, well-being, prosperity, welfare, benefit, behalf, equity, sake, true condition or nature, duty; moral, fitting, proper, righteous, right, upright, just, virtuous, fair, beneficial, successful, in perfect order, accurate, correct, eased, relieved; should, ought, must, necessary.

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