Consideration of Sea Level Rise in Recent LCP Updates: City of Goleta Case Study

In August of 2015, the Coastal Commission unanimously adopted its Sea Level Rise Policy Guidance, which provides recommendations for how to address sea level rise within the context of the Coastal Act. In particular, the document discusses the importance of addressing sea level rise in Local Coastal Programs (LCPs). LCPs are a critical tool for addressing sea level rise because they dictate the types, intensities, and locations of allowable land uses, and therefore provide a framework for implementing proactive adaptation strategies to address sea level rise vulnerabilities. However, many LCPs were certified in the 1980s and 1990s and would benefit from updates to reflect changed conditions, new information and knowledge, and new programs and policies, especially those related to climate change and sea level rise.

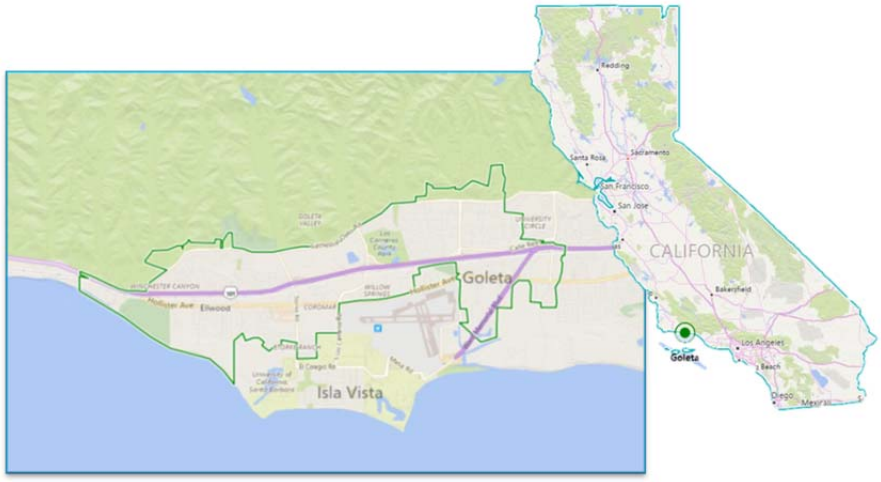
To that end, the Coastal Commission, in coordination with other state agencies including the State Coastal Conservancy and the Ocean Protection Council, has provided significant grant funding to support LCP updates with a particular emphasis on addressing sea level rise. To date, the Coastal Commission has awarded 3 rounds of grants totaling approximately $4.5 million to support the completion of sea level rise vulnerability assessments, adaptation plans, Land Use Plan (LUP) and Implementation Plan (IP) updates, and local adoption and Coastal Commission certification of LCPs. The first round of grants was completed in April of 2016.

Four jurisdictions with grants from the Coastal Commission were chosen as case studies to provide information on various ways that sea level rise adaptation planning and related LCP policy development can be carried out on a local scale. The four jurisdictions – Marin County, and the cities of Pacific Grove, Goleta, and Newport Beach, were chosen because they represent a variety of geographic areas as well as different planning approaches. These four case studies provide valuable information and lessons learned on topics such as finding the right level of detail for vulnerability assessment, the utility of including a specific adaptation planning step, and the importance of adaptive LCP policies. More information on these topics can be found in each of the individual case studies.

The schematic below shows a generalized ideal process for how to address sea level rise through an LCP update. Between 2014 and January 2017, Goleta completed several steps in the development of an LCP, including a vulnerability assessment and draft updates to the LUP and IP. Goleta's process to complete this work provides a good example of using a highly detailed vulnerability assessment to support adaptation planning and LCP policy development. Not only did this vulnerability assessment analyze the expected physical hazards and potential resource impacts associated with sea level rise, it also analyzed the costs associated with those impacts and potential adaptation strategies. Including this fiscal analysis provided the city information that facilitated and streamlined the decision making process for adaptation planning. The Draft LUP and IP now provide a framework for sea level rise adaptation in the city that includes strong policies as well as a trigger-based adaptation approach.

Figure 1. Goleta sea level rise planning as of January 2017

Background



The City of Goleta is a small coastal community in southern Santa Barbara County that does not currently have a certified Local Coastal Program. Situated on the coastal plain between the Santa Ynez Mountains and the Pacific Ocean, the city's shoreline includes a large coastal resort, a golf course, and oil and gas facilities, residential development, commercial and industrial areas, as well as open lands and resources such as the Ellwood Mesa/Sperling Preserve, Devereux Creek, and two coastal estuaries at Bell and Tecolote creeks. Parts of the city are separated from the shoreline by the community of Isla Vista, the University of California Santa Barbara campus, Goleta Slough, and the Santa Barbara airport. With this variety of development and resources, Goleta is known for its beautiful open spaces and mix of both urban and rural land uses.

The city was incorporated in 2002, and its General Plan was prepared in 2006. The city intended for the General Plan to serve as the Land Use Plan (LUP) portion of Local Coastal Program (LCP), but it was not certified due to the need for an expanded level of detail to ensure Coastal Act consistency. In 2009, the Goleta City Council adopted General Plan amendments, and between 2009 and 2014, the city conducted a greenhouse gas inventory, developed a Municipal Energy Efficiency Action Plan, and produced a Climate Action Plan.

Despite this body of work, the extent to which the city's currently certified planning documents address sea level rise is limited. The 2009 General Plan includes a Safety Element that addresses coastal hazards, but it lacks detailed measures to address hazards from sea level rise. The Safety Element includes sections on bluff erosion and retreat, beach erosion and shoreline hazards, and several other topics related to hazards and emergency preparedness. The section on beach erosion and shoreline hazards includes a policy requiring, where appropriate, applications for new development on a beach, dune, or bluff-top property to include a wave uprush and impact

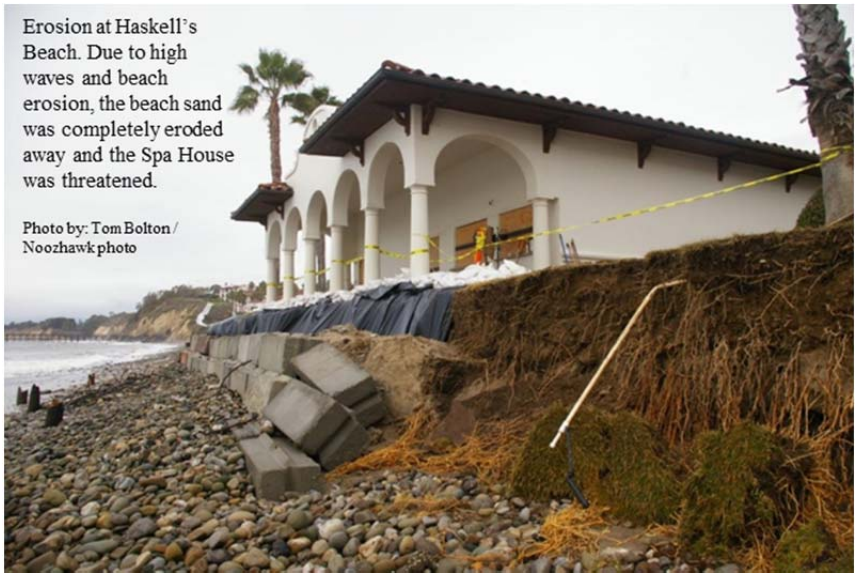
report that addresses the effects of sea level rise on the proposed development. Beyond this policy, however, the General Plan does not include other measures to address hazards specifically as they relate to sea level rise or measures for city-wide adaptation responses or programs.

However, in 2014 the city undertook a renewed effort to work toward LCP certification with the support of a Coastal Commission LCP grant (LCP-13-07), and this effort specifically targeted sea level rise as an issue of concern. The work plan included several tasks scheduled for April 2014 through April 2016, including a sea level rise vulnerability assessment, the development of a Draft Land Use Plan, development of a Draft Implementation Plan, and certification of the LCP.

Sea Level Rise Vulnerability Assessment

In December 2015, the City of Goleta published a *Coastal Hazards Vulnerability and Fiscal Impact Report*. The overall purpose of this report was to better inform land use planning in the city by providing information on the geographic extent and economic consequences of coastal hazards.

To conduct the necessary analysis to produce this report, the city's consultant selected several planning horizons for the analysis, including 2030, 2060, and 2100 and obtained sea level rise projections for each using the current best available science on sea level rise projections, the National Research Council's 2012 report, *Sea-Level Rise for the Coasts of California, Oregon and Washington: Past, Present and Future*. The consultant then adjusted the NRC 2012 projections to account for local uplift along certain parts of the city's coastline, thus producing adjusted low, medium, and high sea level rise scenarios for each identified time step.



Next, the consultant analyzed how sea level rise scenarios could impact various coastal hazards including king tide flooding, high tide flooding, wave impacts, coastal erosion, and storm flooding, along with their combined effects. Locally relevant coastal processes such as barrier beach flooding and lagoon flooding were also examined. Existing models and information were used to inform these analyses, including existing sea level rise modeling (ESA 2015), FEMA flood maps (FEMA 2012), and spatial data from the City and County of Santa Barbara and the Nature Conservancy (TNC 2015). The consultant then produced categories of resource sectors to assess, including land use and structures, coastal armoring, natural resources, public access, hazardous materials, transportation, water supply, wastewater, utilities, and oil and gas facilities. The vulnerability assessment quantitatively and qualitatively discussed the specific resources at risk in each sector at each planning horizon (the present day, 2030, 2060, and 2100).

The assessment found that by 2030, creek flooding, coastal erosion, and coastal flooding will threaten development such as the buildings in Bacara Resort, active and inactive oil wells, some neighborhoods, and certain wastewater treatment infrastructure. By 2060, more development will become vulnerable, including leaking underground fuel tanks and other buildings at the Bacara Resort. By 2100, additional residential areas become impacted, along with several holes of the Sandpiper Golf Course and parts of the light-manufacturing sector in the Old Town Area.

In addition to analyzing the vulnerability of each sector to physical hazards, the report also included a heavy emphasis on the fiscal implications of sea level rise impacts and potential adaptation responses. It analyzed costs associated with the loss of resources due to sea level rise impacts along with the costs of potential adaptation and mitigation approaches, thus producing a fiscal analysis of various adaptation pathways that are available to the City – from "do nothing" to proactive adaptation options. For example, it found that while capping at-risk oil wells could cost $7.9-63.2 million, an oil spill could equate to $257 million in remediation costs. More and more, coastal jurisdictions undertaking similar efforts to update their LCPs for sea level rise are finding that fiscal analyses provide critical information needed to inform decision making and planning processes.

Goleta's report included a series of sector profiles (example above) along with maps of the physical extent the coastal hazard. The sector profile included an overview of the expected impacts, a description of existing conditions, a discussion of the economic consequences of the

Land Use and Structures - Old Town Area

Land Use and Structures: Overview

There are **5** land use categories that occur within the Old Town Area which includes Old Town and portions of the surrounding City, including: (1) residential, (2) industrial, (3) commercial, (4) infrastructure, and (5) recreation/open space.

Existing Conditions

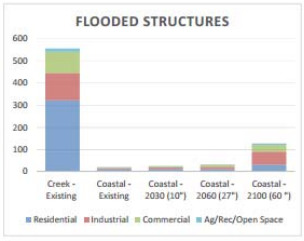
Description: Old Town is recognized as a unique asset and historic center of Goleta. Future development and redevelopment actions are required to respect the current diversity of uses while maintaining Old Town's unique character.

Vulnerabilities: Land use and structures are primarily subject to existing creek flooding and coastal flooding associated with a closed Goleta Slough Mouth. This barrier beach flooding mainly impacts structures and land uses in the Palencia neighborhood, Aero Camino, Storke Ranch, and the neighborhoods between Fairview Ave and Highway 217. For details on the locations of the impacted neighborhoods, refer to Figure A.

Measures of Impact:

- Parcels by land use
- Structures by land use (flooding)
- Square footage of structures by land use (adaptation)

Vulnerabilities: Flooding of Structures



Fiscal Impacts

Damages: Caused primarily by barrier beach flooding.

Residential damages are relatively small in comparison to those of the light-manufacturing sector located within Old Town, which by the year 2100 includes 50 industrial businesses that may contain specialized equipment with replacement costs higher than estimated by FEMA.

Damages	2010	2030	2060	2100
Residential	$0.2 M	$0.3 M	$0.4 M	$1.4 M
Industrial	$0.2 M	$0.5 M	$0.7 M	$10.0 M
Commercial	$0.1 M	$0.2 M	$0.4 M	$2.6 M
Total	$0.6 M	$1.0 M	$1.5 M	$14.0 M

Cleanup costs: could range between $0.5 million and $4.5 million depending on the magnitude and extent of the flooding.

Cost to Elevate	2010	2030	2060	2100
Residential	$1.9 M	$1.9 M	$1.9 M	$9.6 M
Industrial	$1.2 M	$30.0 M	$31.0 M	$130.0 M
Commercial	$0.7 M	$2.7 M	$3.9 M	$48.5 M
Total	**$3.8M**	**$35.0 M**	**$37.0M**	**$188.4 M**

Adaptation Strategies

Range of Strategies: Includes "No Action" and clean up, policy, and regulations, as well as retreat, accommodate, and protection strategies as defined by the California Coastal Commission.

Retreat - Includes policy and/or regulatory options (e.g., downzoning, transfer of development, FEMA repetitive loss clause, and rolling easements) as well as purchase of the vulnerable properties.

Accommodate - Includes elevating structures and inlet management. The reduction in vulnerabilities associated with inlet management supports some hybrid approaches, but management of the Goleta Slough inlet is outside the City's authority.

Elevating - In the short term (approximately 2030) elevating buildings less than 1 foot to avoid flood cleanup costs at a cost of approximately $3.8 million makes more economical sense considering damages and cleanup costs from a large flood event (approximately $5.1 million). Over the medium and long term time horizons (2060, 2100), elevating structures more than 2 feet appears to be maladaptive. **By 2100, estimated damages and cleanup costs could be approximately $18.5 million following a major storm event versus the cost to elevate all of the vulnerable structures at an estimate cost of approximately $188.4 million.**

Inlet Management - With inlet management, the number of structures exposed by 2100 drops from 129 to 14. Furthermore, inlet management with elevation of at risk structures equates to about $5.1 million; whereas inlet management with purchase of at risk parcels would cost an estimated $3.6 million in 2015 dollars.

Protect - The construction of levees to prevent flooding within the most vulnerable neighborhoods is a "gray" protection approach, whereas a "green" protection approach would consist of contoured transitional slopes to accommodate flooding.

Secondary Impacts: Retreat and elevation strategies have few secondary impacts. Inlet management could impact ESHA and listed species. Gray protection options would result in a loss of ESHA wetlands over time Green protection strategies may benefit wetlands by increasing wetland transition slopes.

Findings and Recommendations

Findings:

- Existing creek hazards (FEMA) are the highest hazard in the City. Coastal flooding will be exacerbated by SLR, however future climate impacts on creek flooding not available.
- Coastal flooding damages to structures in Goleta could increase dramatically by 416% between the time horizons of 2060 and 2100.
- Adaptation costs to elevate and accommodate coastal flooding by 2100 ($175 million) exceed damages ($14 million) and cleanup (approximately $5 million) by an order of magnitude.
- The Storke Ranch neighborhood becomes exposed around 2100, when Goleta and Devereux Sloughs come together.
- Coastal flooding impacts the light manufacturing sector the greatest between 2 and 5 feet of SLR during the time period of 2060 to 2100.

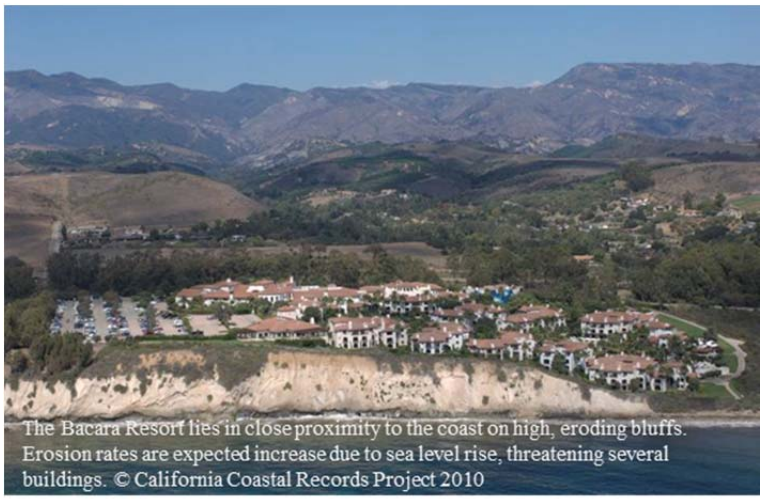
Recommendations:

- Conduct coastal confluence modeling to better assess future vulnerabilities associated with stream flood hazards exacerbated by sea level rise to provide projections of future flood extents and depths.
- Engage in regional inlet management discussions with the City of Santa Barbara and the County of Santa Barbara.
- Establish a repetitive loss policy to trigger eminent domain in combination with a Transfer of Development (TDR) Program. Once a property had multiple flood insurance claims the policy would take effect.
- Adjust building codes to allow for increased building heights by additional freeboard based on sea level rise projections for parcels projected to be impacted by flooding after 2060.

expected impacts, a list of potential adaptation strategies, and summary findings and recommendations. These short, standalone sector profiles were useful communication tools because they summarized key information to an extent that made the information easy to digest and understand. Notably, the maps showed the coastal hazard areas associated with the highest amount of predicted sea level rise for each time step, 2010, 2030, 2060, and 2100, rather than showing the medium or low sea level rise scenarios.

While the report was clear and user-friendly, the sector profiles could be improved by including footnotes explaining which sea level rise scenario and hazard types (e.g., inundation or flooding) are included to generate the physical extent of the "coastal hazard zone" shown on each map. Currently, the maps leave that information unspecified and a user must find that information in the body of the report. Coastal Commission staff has found that an important but commonly overlooked aspect of communicating the findings of a vulnerability assessment is the clear explanation of the assumptions behind the described result. Maps should specify what sea level rise scenarios – i.e., the low, medium, high scenario, or combination of scenarios –are depicted, along with which coastal processes—i.e., inundation, storm flooding (and if so, what size storm), or erosion, or combination thereof. Distinguishing between these possible scenarios is critical to properly convey the type of hazard being depicted and therefore type of planning actions that are needed in response. The storm and non-storm analyses in particular will lead to different adaptation approaches to be implemented through the LCP.

In addition to findings on potential impacts, the city's vulnerability assessment includes discussions of possible adaptation approaches to reduce risks from sea level rise, as well as policy recommendations for use in the development of the LCP. The report categorizes possible adaptation approaches into the protection approach, the accommodation approach, the retreat approach, the hybrid approach, and the "do nothing" approach along with examples of each. This information was then applied to the development of a Draft Land Use Plan.


The Bacara Resort lies in close proximity to the coast on high, eroding bluffs. Erosion rates are expected increase due to sea level rise, threatening several buildings. © California Coastal Records Project 2010

Development of the Draft LCP

The Draft Land Use Plan was developed using the General Plan as a starting point. The Safety Element of the General Plan was used to develop the coastal hazards section of the LUP, and this section contained the majority of policies related to sea level rise. Over the course of many months, city and Coastal Commission staff exchanged several iterations of LUP, focusing on adding the level of detail necessary to carry out the requirements of the Coastal Act as well as

implement the findings of the *Coastal Hazards Vulnerability and Fiscal Impact Report* (Report). The city drafted a number of policies that implemented the recommendations of the Report, such as an elevated height restriction in Old Town Goleta designed to accommodate an increase of freeboard elevations in response to expected flooding impacts; a prohibition of shoreline protective devices for bluff-top and non-bluff development; sediment management programs; increased consideration of sea level rise in site-specific coastal hazard reports; a repetitive loss clause program to rezone at-risk areas over time to less intensive land uses; a fee simple acquisition program for lands in hazardous areas; rolling easements that enable natural coastal processes to continue; and establishment of sand mitigation and public recreation fees.

Aerial photo of the boundary between the Sandpiper Gold Course and the Ellwood Mesa/Sperling Preserve. Increased erosion due to sea level rise threaten both. © California Coastal Records Project 2010

These draft policies represent a relatively progressive approach to sea level rise planning in that they include more innovative ideas for sea level rise adaptation policies being considered in the sea level rise adaptation field. While the LUP has not been certified yet, the draft policies have been used to develop a conceptual framework for the Draft Implementation Plan, including triggers for the implementation of certain policies.

While the triggers in the Draft IP have not been reviewed in detail by Coastal Commission staff, they represent a practical method for the application of policies due to their connection to actual, observed increases in sea level. For example, in the case of bluff top areas, when 1 foot of sea level rise is observed, the city would prioritize soft solutions for protection of public access on Haskell's Beach and require that bluff and shoreline protective devices for existing development not be permitted without meeting required conditions. After observing 2 feet of sea level rise, the city would update cliff erosion setback policy to account for increased erosion rates, include funds for critical infrastructure like bridges and roadways in the 5-year Capital Improvement Plan, and establish appropriate hazard abatement districts. Three feet of sea level rise would trigger phased removal of existing development, including two buildings at the Bacara resort, 6 holes of the Sandpiper Golf Course, and trail re-alignment in the Ellwood Preserve. In addition to these triggers for bluff top areas, similar triggers are also drafted for low-lying areas. While the specifics of phased adaptation strategies need more careful review by Coastal Commission staff for consistency with the Coastal Act, they represent a good conceptual approach of the application of sea level rise adaptation measures.

Next Steps

To date, the city has completed a sea level rise vulnerability assessment, a Draft LUP that has gone through extensive iterative review with Commission staff, and a Draft IP; however,

certification of the LCP has not yet occurred. The LUP and IP both remain in draft form, and additional iterative reviews and collaboration must occur between the city and Coastal Commission staffs to address various subjects of concern before the LCP is ready for both local and Coastal Commission adoption hearings. Therefore, considerable work remains to achieve certification of the LCP. However, this jurisdiction provides a strong example of sea level rise adaptation planning through the development of a Local Coastal Program.

This product was funded with qualified outer continental shelf oil and gas revenues by the Coastal Impact Assistance Program of the Fish and Wildlife Service, U.S. Department of the Interior