

What is the UCSB Sea Level Rise (SLR) Adaptation Strategy?

The UCSB Sea Level Rise (SLR) Adaptation Strategy implements the UCSB Long Range Development Plan (LRDP) requirement to submit a comprehensive sea level rise hazards assessment and adaptation plan to the Coastal Commission as an LRDP amendment. The plan applies the best available information to assess “sea level rise for the UCSB shoreline, evaluating erosion, flooding and other coastal vulnerabilities of the campus’ built and natural environment, assuming as much as 2 meters of sea level rise by the year 2100.” The UCSB SLR Adaptation Strategy includes a vulnerability assessment, specific identification of needed action on campus, recommended strategies on how to minimize the SLR risks, an analysis of campus SLR impacts at site-specific and regional scales, and identification of recommendations that would require changes to LRDP amendments.

Understanding SLR Science at the Global, State, & Regional Level

Climate scientists have studied SLR to understand its impacts on ecosystems, wildlife, and human populations, especially at the global, state, and regional levels. At the global level, the Intergovernmental Panel on Climate Change (IPCC) has reported that there will be significant changes in sea level rise regardless of emission changes around the globe. At the state level, California, through the Ocean Protection Council and California Coastal Commission, has developed guidance for protecting the California coast. Much like the IPCC, the guidance set by California highlights the uncertainty regarding the future sea level conditions due to global greenhouse gas emissions. Sandy beaches, a feature seen throughout the California coast, are vulnerable to rising sea levels. Geologists have identified a variety of littoral cells along the California coast “that aid in understanding the dynamics of sand flow along the coast” (UCSB Sea Level Rise Adaptation Strategy, p. 29). The Santa Barbara and UCSB shoreline is a part of a longshore littoral cell. Therefore, understanding the dynamics of UCSB and Santa Barbara beaches will be essential in how adaptation strategies are created in response to sea level rise.

UCSB’s Shoreline

The UCSB SLR Adaptation plan utilizes Sea level rise data and impact modeling provided by the Coastal Storm Modeling System for Southern California (CoSMos) and Our Coast Our Future (OCOF) to understand the vulnerabilities and impacts posed by sea level rise at UCSB. UCSB’s beaches are composed primarily of sandy beaches and coastal bluffs. Sandy beaches are affected by wave action and sand supply and are vulnerable to sea level rise, especially where coastal bluffs and infrastructure contain beach migration. The threat of sea level rise means that risks can occur on UCSB-owned property ranging from potential tsunami risks, flooding, cliff erosion, and shoreline retreat.

Vulnerability Assessment

The UCSB SLR Adaptation Strategy plan highlights and showcases the specific vulnerabilities our campus will face. The vulnerability assessment is a crucial part of how UCSB understands and navigates the plan's implementation, as it highlights the different location-specific vulnerabilities faced by our campus. This aids in identifying specific campus areas, facilities, structures, coastal areas such as beach access, and wetlands along the Goleta Slough and Pacific Ocean shoreline that are at risk from rising sea levels.

Adaptation Strategies

The plan outlines many strategies to strengthen monitoring, adaptation studies, and adaptation actions. Monitoring is an essential part of UCSB’s plan. Monitoring events such as extreme flooding can aid in creating flood mitigation or relocation strategies over the long term. The plan recommends further adaptation studies to identify site-specific actions needed. Adaptation strategies include further assessment of particular facilities, coordinating with other jurisdictions, placing floodwalls if required, and relocation and restoration of different development nodes. As the UCSB SLR Adaptation Strategy Plan is rolled out, the campus community and community members surrounding UCSB will have the opportunity to engage with the UCSB SLR Adaptation Strategy.

AREA:

1

OVERVIEW

Area 1 in UCSB's Sea Level Rise (SLR) Adaptation Strategy includes the Devereux Slough and the surrounding area, encompassing the Coal Oil Point Reserve (COPR), North Campus Open Space (NCOS), and several housing developments. Both COPR and NCOS are involved with restoration and research projects that are especially important considering the vulnerable species/habitats in the area, such as the Snowy Plovers and Coastal Dunes at Sands Beach. Sands Beach and the Devereux Slough are popular recreational sites. The harmony between public use, education, and conservation is what makes this area so special but Sea Level Rise (SLR) and other climate change associated impacts may affect this balance. As SLR continues, beach erosion will impact the local ecosystems, and flooding potential around the Devereux Slough will impact the surrounding developments. In order to preserve this balance between people and nature, UCSB's Sea Level Rise Adaptation Strategy suggests long-term monitoring, studies, restoration projects, and adaptive management plans be implemented.

POTENTIAL IMPACTS

Shoreline Erosion: With 2m SLR, the shoreline is predicted to move further inland by 200 ft. or more at the slough mouth. The more the shoreline retreats, the less space there is for the ecosystem to persist. As UCSB's LRDP requires the university to maintain public access to Sands Beach, the shrinking of the beach will increase the impacts of human activity on the sensitive wildlife found there.

Flooding: Footprint and risk of flooding increases in/around the slough, potentially affecting surrounding developments and access to the slough. Flooding at the North and South fingers will affect Slough Road, which already become flooded under current conditions. Although very unlikely to occur, flooding caused by tsunamis can cause inundation into upper Devereux Slough and the greenhouse site located by the South finger.

TIMELINE

The assessment focuses on potential flooding over the next 100 years.

ADAPTATION STRATEGIES & PROPOSED NEXT STEPS

Further restoration of Devereux Slough is recommended as it will increase its flood mitigation capacity and allow for better habitat transition. A SLR and wetland regression assessment of lower slough is proposed for when sea levels are higher. In order to assess the condition of the slough system, comprehensive monitoring with coordination between COPR and NCOS is recommended to start in 1-3 years. To protect the sensitive species at Sands Beach, the COPR management plan is to be updated in the near future to address SLR impacts to the area and how this may affect recreational access. An amendment has been proposed to ensure that the retreat of use along Slough Road occurs as/when needed (which may be sooner than originally planned).

LRDP Policy ESH-51 requires the removal of the greenhouse on West Campus (between the Devereux North Knoll and Devereux South Knoll) by 2024.

AREA: 2

OVERVIEW

Area 2 in UCSB's Sea Level Rise (SLR) Adaptation Strategy extends from the bluffs at COPR to the western edge of IV and includes Devereux Beach, the West Campus Bluffs, and the buildings on the bluff by Sands Beach. This area is heavily used for recreation as the West Campus Bluffs provide great views of the sunset and access to popular beaches but it's also biologically important! From blufftop vernal pools to the COPR Docent Building, this area is as important to us as it is to the local ecosystem. As sea levels rise, beach and bluff erosion will accelerate and impact public access to Devereux and Sands Beach as well as COPR operations. UCSB's SLR Plan addresses these impacts by proposing shoreline/bluff monitoring, new access points, and managed retreat of paths and certain buildings.

POTENTIAL IMPACTS

Beach Erosion: The current width of Devereux Beach ranges between 0-45m, SLR will reduce this width and the structure known as the "Jailhouse" could accelerate beach erosion in its vicinity. Greater beach erosion will accelerate bluff erosion, impact public use, and affect biodiversity. Beach-goers, intertidal invertebrates, and wintering shorebirds will be among the most impacted groups.

Bluff Erosion: The nearly 35 foot bluffs are actively eroding at a rate of 2-16 in/yr according to a 2015 ESA assessment. With 2m of SLR, the bluff edge in this area will retreat 100ft or more. This will impact the developments, access points, and vernal pools on the blufftop. The COPR team, people who use the blufftop, and species associated with the vernal pools will be among the most impacted.

TIMELINE

"It is anticipated that these buildings are the first among all five study areas that will require removal or relocation due to SLR and cliff erosion..." (pg. 60)

ADAPTATION STRATEGIES & PROPOSED NEXT STEPS

UCSB's Sea Level Rise (SLR) Adaptation strategy proposes monitoring and studying of the beach/shoreline dynamics in effort to understand the status of beach and bluff erosion. These results will be used to inform adaptation strategies. As they're already in danger of bluff erosion, the removal of Cliff House, COPR Docent Office, and Dovecote is proposed to occur in 5-10 years, the COPR Docent Office will be relocated to minimize impacts to their operations. To preserve public access in the area and protect the vernal pools, studies will need to be conducted to determine where new SLR resilient access trails/stairways can be implemented.

Coordination with SB County needed for continued access via Camino Majorca stairs but UCSB will provide new access from University property, currently proposed at the "jailhouse" location.

AREA: 3

OVERVIEW

Area 3 of UCSB's Sea Level Rise (SLR) Adaptation Strategy stretches along the coastline from Depressions beach to the University Marine Sciences facilities. The UCSB lagoon remains one of the focal points in the area facing potential impacts. Current understanding suggests that two islands will form if sea level rise projections are accurate. This poses an imminent threat to public access trails and campus infrastructure. SLR also possesses a threat to beach resources, as beach erosion continues to increase. Storm surges, king tides, and large swells can factor into increased erosion as well as variable shorelines.

POTENTIAL IMPACTS

The impacts of long-term sea-level rise affect both the structural components of the UCSB campus and public access. Large loss of sandy beach resources through sea level rise will impact public walking paths along the UCSB lagoon. Infrastructure threats include the lagoon's weir system, the eastern berm, and the sea-water intake system. Potential berm breaches due to storm surges could allow for a lagoon water level decrease of 3-5 feet. Given a potential berm breach, around 2 meters of sea level rise, and a 100-year storm event, campus point, and lagoon island could split into two islands only accessible at low tide.

ADAPTATION STRATEGIES

Continuous monitoring and updating of the Lagoon Management Plan will provide detailed adaptation strategies. Monitoring includes understanding water stage patterns and hydrology, ecological function, habitat functions, etc. These assessments would help identify the best path for adaptation in 5 to 15 years. UCSB will also need to address beach loss, this can be done with sand retention to maintain beach width. Connecting the lagoon mouth to the ocean, and removing Lagoon Road to adapt to rising sea levels allows for a more natural system that will allow for better adaptation to long-term sea level rise, preventing human interference to protect against coastal erosion. The threatened seawater intake system provides research and educational benefits that will need to be protected to ensure its positive impact on the university. Ongoing monitoring and development of adaptation strategies will ensure a thorough transition.

PROPOSED NEXT STEPS

Continuous monitoring of sea level rise and erosion rates is needed to develop adaptation strategies based on measured impacts. Along with these measures, it is essential to maintain the seawater intake system. Debris will need to be removed and adaptation strategies as mentioned before will be implemented to relocate public access and recreation. Public access will continue to shift as sea levels rise and will be updated to allow for safe access, given Lagoon island might become inaccessible given certain tides.

AREA: 4

OVERVIEW

Area 4 of UCSB's Sea Level Rise (SLR) Adaptation Strategy includes the Marine Sciences facilities which sit atop bluffs exposed to coastal erosion, Lagoon Road, and dorms that are subjected to disruption and possible relocation. Along Lagoon Road a myriad of utilities includes power, sewage, water, and gas lines.

POTENTIAL IMPACTS

Campus infrastructure poses the potential to cause environmental damage and should be relocated or removed prior to erosion. UCSB facilities such as the Marine Sciences Building and Anacapa dorms will face future threats as sea level rise and erosion rates continue at their current projections. Public access to the beach will also be affected. Lagoon Road and Lot 6 are not immediately threatened but could be vulnerable to upper bluff erosion and will be monitored to determine the best adaptation strategy. Other infrastructure such as utilities that run along Lagoon Road will also be impacted.

TIMELINE

Erosion threatening UCSB facilities varies based on location. The Manzanita dorms will be affected in ~100 years with an erosion rate of 16 inches/year. A minimum retreat rate along Lagoon Road will threaten Lagoon Road in ~7 years and Anacapa Hall in ~36 years. Throughout this process, ongoing monitoring will occur taking 1-3 years to set up and establish until meaningful data can be acquired. Lot 6 and Lagoon Road are not immediately threatened but have a strong potential to be affected and as upper bluff erosion continues, ongoing monitoring will be conducted to assess threat levels and the best response strategy.

ADAPTATION STRATEGIES

Adaptation strategies include allowing sea levels to rise with little to no coastal protection to mitigate sand loss. Furthermore, this will enable the bluffs to strengthen themselves for future sea level rise. Along with this strategy, sand replenishment is also an option, however, this technique is untested and can have varying results. It is also expensive and could potentially result in the loss of replenished sand. University facilities and utilities will need to be relocated as infrastructure becomes threatened. Possible relocation sites will be determined as assessments continue, this will involve coordination with Facilities Management.

PROPOSED NEXT STEPS

The proposed next steps include continuous monitoring of sea level rise and erosion rates as well as developing adaptation strategies based on monitoring results. Further steps include removing debris and infrastructure caused by erosion and maintaining public pathways and access. The plan also recommends engaging local tribal representatives to protect cultural heritage and resources.

AREA: 5

OVERVIEW

Area Five in UCSB's Sea Level Rise (SLR) Adaptation Strategy includes the North Bluffs and Storke Campus. The North Bluffs encompasses lands adjacent to the northern boundary of the Main Campus, running approximately 2.5 miles along Goleta Slough and the Storke Campus. The Storke Campus section includes East Storke Wetland, a portion of Mesa Road, Storke Family Housing, the Santa Ynez Apartments, the San Joaquin Villages, and portions of Los Carneros Road.

POTENTIAL IMPACTS

Potential impacts include flooding and changes to wetland ecosystems. There are places in Area Five, such as along North Bluffs, that will not be significantly threatened by sea level rise, but the western portion of Mesa Road and Storke Campus are already exposed to flooding during extreme events. Furthermore, long-term flooding risks during extreme weather events will reoccur. Goleta Slough may face significant changes with long-term sea level rise. There could also be potential changes to the whole Goleta Slough Wetland system due to the changes in sea level rise and sedimentation. San Joaquin Villages, Santa Ynez, Storke Family Housing, and parts of Los Carneros Road have the potential for flooding, which can pose a challenge for residents who live in these campus-owned properties.

TIMELINE

"The assessment focuses on potential flooding over the next 100 years. Due to the flooding risks posed upon the wetlands and campus housing. The UCSB SLR LRDP also recommends that wetland restoration should begin in the next decade"
UCSB SLR Adaptation Strategy p. 117.

ADAPTATION STRATEGIES

The plan highlights the importance of addressing sea level rise through "specific adaptation pathways of this plan seek to minimize sea level rise impacts to UCSB's human, built and natural environments while meeting the requirements of the California Coastal Act". Monitoring extreme flood events in Area 5 will help create flood mitigation and relocation strategies. Monitoring public services in flooding zones and collaboration with adjacent management partners will also be an important strategy in addressing sea level rise. Restoration in the Storke/Goleta Slough wetland may also be considered with adjacent jurisdictions.

PROPOSED NEXT STEPS (MONITORING / RETREAT)

The proposed next steps include UCSB continuing to implement existing LRDP policies in collaboration with Goleta Slough Management Company and other jurisdictions that may have a stake in how water management and flood mitigation strategies are implemented in the future. The plan also recommends that UCSB continue to support and initiate studies required to allow the university to invest and take action on restoring wetlands and scale back development nodes north of Mesa Road. Implementing a utility and flood monitoring program and potentially an interim floodwall for lower Mesa Road and Storke Campus may be necessary.

AREA: Isla Vista

OVERVIEW

In this brief overview, you will learn about Isla Vista (IV), an unincorporated community in SB County, and the effects of sea level rise on the community. If you live in Isla Vista, you are familiar with its sandy beaches, bluffs, and coastal area. The **UCSB Sea Level Rise (SLR) Adaptation Strategy** does not include most areas of Isla Vista in its scope as it falls outside of Campus boundaries. Isla Vista is included in the Santa Barbara County Sea Level Rise & Coastal Hazards Vulnerability Assessment (July 2017). The Isla Vista Bluff Policy developed by the County tightens the buffer distance between properties and the edge of the bluff.

POTENTIAL IMPACTS

Isla Vista faces climate induced cliff erosion, cliff retreat, and coastal erosion. Residential areas located alongside Del Playa Drive and Isla Vista parks face serious threats. The County also reports there will be **permanent loss of land alongside blufftops**. Isla Vista has multiple communities that would face high areas of social vulnerability. Such communities include renters, households without a vehicle, Median Household Income and populations living below the Federal _____. One of the biggest impacts Isla Vista faces is cliff erosion, cliff retreat, and coastal erosion. Many residential areas near cliffs in Isla Vista face serious threats. Coastal flooding is a hazard Isla Vista Parks will face (County of SB LRDP Vul. Assessment, p. 4-16), permanent loss of land alongside blufftops (SB County Climate Change Vulnerability Assessment, p. 19) The County of SB LRDP Vul. The assessment highlights how one of highest areas of social vulnerability includes Isla Vista (p. 4-50).

High poverty areas located in Isla Vista: Renters, Households without a Vehicle, Median Household Income, Population Living Below the Federal Poverty Level Note: Isla Vista is an anomaly as most occupants are college students whose income may come from parents who do not work or live in SB. (County of SB LRDP Vul. Assessment, p. 4-51)

TIMELINE

“By 2100, 24% of all residential structures studied (within the unincorporated areas of the County) are projected to face coastal hazards (18% under the coastal armoring scenario). Residential structures also constitute approximately 85% of all of the structures exposed to coastal erosion and flooding hazards, making this the largest impacted land use category.” (ES-5)

AREA: Isla Vista

ADAPTATION STRATEGIES

Santa Barbara County requires property owners alongside Isla Vista's bluffs to follow building code requirements to protect the welfare of occupants of the buildings along the bluffs. Such building code requirements include requiring a 10 foot threshold for any portion of a building foundation from the bluff face and require property owners to obtain services from licensed professionals i.e. geotechnical engineer who can evaluate the safety of the building depending on the distance between the property and the Isla Vista Bluffs.

Property owners have three different forms of action they can take for the properties alongside the bluffs: site specific study, cut back, and site specific study deepened foundations.

PROPOSED NEXT STEPS (MONITORING / RETREAT)

Many of the Vulnerability Assessments provided by Santa Barbara County do not propose any next steps. The assessments showcase and highlight the communities that would be the most impacted by climate change. The Isla Vista Bluff policy highlights a policy that land development entities must follow alongside the coast. The county is placing regulations on property owners and land developers. "In the case of Isla Vista, this would require a minimum setback of 40 feet as measured from the bluff face to any part of the building's foundation" (p.2)