



Adaptation Strategies for Resilient Coastlines

Municipalities have a suite of options for planning more resilient coastlines. Adaptation strategies range from infrastructure solutions to best management practices and land use policies. This table was designed to assist city planners with evaluating these strategies as well as to provide insight into the planning challenges and opportunities associated with each.

ADAPTATION STRATEGIES	PLANNING CONSIDERATIONS
HARD SHORELINE PROTECTION STRATEGIES	
Armoring	Can result in “coastal squeeze” resulting in a loss of the beach and public access. Mitigation will be required for losses and impacts to neighboring parcels. Can only be used to protect existing development. However, there is not a clear definition of “existing development” in the Coastal Act. Coastal Commission may apply expiration dates to permits for armoring (so not in perpetuity.)
LIVING SHORELINES AND OTHER MORE NATURAL PROTECTION STRATEGIES	
Sand Nourishment/ Sediment Management	May result in short and long-term ecological impacts from sediment mining/dredging, sand placement, and sand shifting to other areas. This is a maintenance strategy that will require ongoing planning and investments because intensity and frequency of storms will affect the durability and effectiveness.
Dynamic Cobble Berm/ Dune	The beach footprint of this strategy may impede beach access or recreational use. Coastal visual impacts should also be considered depending on height. Proximity to roads and sand drift impacts to transportation corridors should also be considered.
Offshore Breakwater and/ or Offshore Oyster Reefs	Can shift existing habitat conditions resulting in required mitigation. Needs to be planned to avoid any marine conservation/protection areas. Can result in impacts to surfing and marine-based commercial or recreation uses. Will lose breakwater function as sea level rises.
Wetland, Oyster, Eelgrass Habitat	Protection of community assets and property (roads, property, critical structures) will need to be aligned with the adaptation strategies for the natural resource habitats and species.

ACCOMODATION STRATEGIES PLANNING CONSIDERATIONS

ZONING, ORDINANCES, AND REGULATIONS

Coastal Hazard Zone Overlay	Can be used to allow for continued development while requiring structures to be sited and built to be more resilient to impacts. Would require additional review and analysis of developments/ re-developments based on the city's sea level rise vulnerability assessment.
Special Use Permits	Can be used to limit critical facility development in vulnerable areas or limit areas to parks, open space or uses less sensitive to flooding or closure.
Coastal Bluff and Non-Bluff Setbacks	Setbacks may change as erosion or flooding increases. May require additional land acquisition.
Building Code/ Elevation Requirements	Can be set based on lifespan of the structure and/or sensitivity to flooding exposure.
Capital Improvement Program Funding	Can be updated to include requirements for demonstrating how the project is accommodating sea level rise or erosion before funding is granted.
Real Estate Disclosures/ Deed Restrictions	Can be tied to a hazard zone overlay.

CONSERVATION STRATEGIES PLANNING CONSIDERATIONS

ZONING, ORDINANCES, AND REGULATIONS

Conservation/ Retreat Zones	Can be used to restrict development that requires hard shoreline protection in order to conserve natural resources and public trust assets.
Setbacks	Setbacks may change as erosion or flooding increases. May require additional land acquisition.

Additional Resources for Sea Level Rise Adaptation Integration into Land-Use Policy and Practices

1. Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use How Governments Can Use Land-Use Practices to Adapt to Sea-Level Rise (Jessica Grannis of Georgetown Climate Center, October 2011) http://www.georgetown-climate.org/files/report/Adaptation_Tool_Kit_SLR.pdf
2. Developing a model ordinance for California Local governments to integrate sea-level rise adaptation into existing land use plan (Sean Hecht and Megan Herzog of UCLA School of Law) To be released soon at: <http://dornsife.usc.edu/uscseagrant/hecht-and-herzog/>
3. A Model Sea-Level Rise Ordinance and Case Study of Implementation Barriers in Maryland (Jessica Grannis of Georgetown Climate Center, December 2012) <http://www.georgetownclimate.org/files/report/Zoning%20for%20Sea-Level%20Rise%20Executive%20Summary%20Final.pdf>



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