City of Tampa Florida

City Planning

Report #3
Application of Sea Level Rise Strategies

Land Regulatory Response to Sea Level Rise

CITY OF TAMPA

LAND REGULATORY RESPONSE TO SEA-LEVEL RISE

REPORT #3: APPLICATION OF SLR STRATEGIES

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City of Tampa Florida

City Planning

Best Practices: Report #3
Sea Level Rise In Tampa: A Policy Approach

Description of Each Regulatory Mechanism

PROJECT STATUS

This document provides a summary of findings for Task 3 in the City of Tampa's Land Use Regulatory Response to Sea-level Rise project. This task was focused on a literature review and policy discussions with stakeholders to understand regulatory options for sea-level rise that are to be found in other municipalities. Final products include an excel spreadsheet matrix that categorizes policies, and this summary, which condenses the expansive list of policies encountered. It also includes an additional summary that re-categorizes policies into geographical situations. This will be used for specific application of policies in the City of Tampa.

SUMMARY OF SEA-LEVEL RISE POLICY PRECEDENT

Generally, a few major strategies, or themes, emerge when reviewing recommended and implemented policies to address sea-level rise. These policies can be located in a handful of policy documents, including:

- The Comprehensive Plan
- The Code of Ordinances, mostly in the Building and Land Development Codes
- The Stormwater Technical Standards Manual, both for Public and Private Development
- Local Building Code Amendments
- The Transportation Technical Manual
- The Local Mitigation Strategy
- The Post-Disaster Redevelopment Plan
- The Regional Environmental Authority, such as the Environmental Protection Commission in Hillsborough County
- In Florida, in the Regional Water Management District policies and guidelines
- Also, in Florida, Statewide mandates such as those found under Chapter 163, Intergovernmental Programs, which regulates policy such as Peril of Flood

Municipalities execute widely varying degrees of policies, with different levels of commitment. This research attempts to capture the array of possibilities but focuses on those communities that have initiated a comprehensive approach toward sea-level rise.

In the coming months, the City of Tampa will engage stakeholders and legislators, and will evaluate location and cost-based scenarios for the implementation of policies.

The following provides a summary of policies and regulations, and locates them within their appropriate policy document:

POLICY LISTS

Comprehensive Plan

- Incorporate sea-level rise into planning and establish (regional) goals
- Incorporate the community in the hazard identification processes, including developing instruments such as a sea-level rise committee or commission, a citizen advisory group, a resiliency office, and include considerations of addressing sea-level rise in economic development.
- Utilize or generate public open space to mitigate sea-level rise, to establish a flexible-use area at the coast while establishing community amenities and value for residents.
- Identify where impacts will occur through mapping and inventory processes.
- Incorporate sea-level rise into construction reviews and permitting considerations, and use similar criteria to guide decision-making for public infrastructure.
- Work toward mitigating sea-level rise through new projects, whether public or private.
- Establish buffer zones and setbacks that will enable habitat zones to migrate, prevent erosion and prepare property owners for future coastal conditions.
- Consider a comprehensive, fair and equitable approach to addressing repetitive loss properties.
- Consider and prioritize buyouts.
- Consider shoreline stabilization practices that incorporate living systems and remove hard-edged solutions for separating land from sea.
- Educate the public on this changing environmental condition.
- Create sea-level rise overlay areas
- Disclose when properties are in existing or future sunny day flood hazard areas (based upon an agreed upon time horizon and scenario).
- Create funding streams for mitigating or adapting to future challenges due to sea-level rise.
- Coordinate between agencies, within and external to government, and within and external to specific governmental departments.
- Consider issues of equity, (climate) gentrification and other social factors of coastal communities when creating sea-level rise policy.
- Confront the systemic problem of global warming and greenhouse gas emissions.
- Consider landscape ecosystems as a partner is confronting the challenge of sea-level rise. Healthy habitats can play a large role in mitigating erosion and can provide higher levels of accretion in coastal soils, over time.
- Consider the effects of sea-level rise on our drainage systems and begin a path toward adapting to future water elevations.
- Identify areas to remove septic, and consider higher groundwater elevations for future installation.

Code of Ordinances

Ch. 5: Building Code (Flood Resistant Construction)

- Use future groundwater conditions in construction, for infrastructure such as septic tanks, water distribution, roadway construction and other utilities.
- Establish regulations for sea walls, and try to remove them going into the future. Sea walls are not a sustainable solution considering changing water levels and impacts to coastal environments.
- Elevate buildings and their utilities to consider changing water elevations at the coast. Allow buildings that modify their ground floor or MEP components to trade FAR or provide other incentives that can make this a reasonable trade-off in value.
- Allow buildings to measure their height from design flood elevation, but trade width for added height, allowing buildings to encroach into established setbacks.
- Allow buildings within the .2% flood zone to access variance rules, to prepare for future conditions.
- Increase design flood elevations to 2 feet in specific flood zones.
- Take care of MEP, getting it out of the flood zone. This can be incentivized by allowing encroachments into setbacks and outside of bulk plane provisions, or by trading internal space for additional allowable building space.
- Create design guidelines for elevated buildings.

Ch. 16: Parks and Rec

- Leverage funding mechanisms to create more coastal open space
- Support adaptation of open space by integrating drainage services

Ch 26: Utilities

- Use future SLR benchmarks for the placement of utilities, especially for multi-family
- Do not count MEP space inside of building, or space to access MEP, to be counted against FAR
- Allow MEP in setback space

Ch 27: Land Use

- Establish an erosion-based minimum setback or buffer zone for shoreline development. Include low maintenance zones where feasible
- Impact fees: Require developers to pay fees to supplement costs that may be incurred in the future due to sea-level rise or exacerbated erosion conditions
- Use (tax) incentives for property owners to raise structures out of the floodway, remove structures from the property or create conservation easements
- Allow FAR to be deducted or exchanged for property owners that modify buildings or utilities to adapt to sea-level rise.

- Use transfer of development rights with bonuses attached to encourage dense and inland development.
  Rolling easements, either voluntary (and are connected to tax credits or other incentives) or purchased, allow property owners to stay on a property but ensure the long-term ability for coastal migration as water levels rise.
- Prohibit densification in planning areas within the expected sea-level rise zone
- Establish overlays that pertain to sea-level rise
- Property Disclosure: Disclosure laws may inform buyers of the risk they are assuming as conditions may change in the future, and lets the buyer assume that risk. However, by establishing overlay zoning areas the risk is codified and specific requirements or constraints may be established. An additional policy can be implemented that mandates special hazard zones be disclosed in property purchase transactions, creating a separate level of information to prospective buyers.

Local Building Code Amendments
Pinellas County has established this amendment section to supersede State code for sea walls, pools and minimum setbacks (from sea walls).

Stormwater Technical Standards
Design to an established future sea-level rise scenario and time horizon, and work to upgrade existing infrastructure to those levels while incorporating flexibility through nature based solutions.

Transportation Technical Standards
- Design to an established future sea-level rise scenario and time horizon.
- Establish minimum elevation levels
- Increase base material standards for areas vulnerable to future ground water levels.
- Identify streets that will have problems in the future and work on agreements with the communities that those roads support.
- Consider sea-level rise and habitat migration needs when designing roads near the coast.
- Integrate soft, 'living' armoring techniques

Local Mitigation Strategy
- Establish and prioritize a list of mitigation projects to both mitigate and adapt to future sea-levels.
- Use the Hazard Mitigation document and process to increase awareness in the community about how the community may be impacted by future sea-levels.

Post Disaster Redevelopment Plan

- Establish rebuilding policies, after a major disaster, which incorporate a forward looking, future sea-level rise scenario.
- Use post-disaster situations as a moment to reconsider where and how to rebuild communities, using incentives or buy-outs to relocate structures and residents that are having to cope with previously unconsidered environmental factors. Understand the insurance industry and process for redevelopment.

REGIONAL POLICY

Policy at the county or regional level are out of the direct purview of the City's control, however there is usually increased influence from major participants or population centers. Opportunities to address sea-level rise include:

- Minimizing impacts to natural resource lands and coastal habitats

STATE-WIDE POLICY

While state policy is out of the hands of a local municipality, there is a potential to coordinate and motivate state law-makers to create policy that would help to unify an approach toward sea-level rise. At the state level Chapter 163, in Florida, has created sea-level rise specific regulations. Some other states or recommendations include different or increased measures, such as:

- Requiring local governments to adopt local coastal programs that, among other things, ensure that new development minimizes risk in areas of high geologic and flood hazard, does not contribute to erosion, does not require construction of armoring, and does not substantially alter natural landforms.
- Developing a long-term statewide program to prioritize high risk floodplain areas for conservation through acquisition and easement.
- Encouraging or requiring that local governments use an extended planning time frame (e.g., planning for future development over the next 50 years, rather than the current practice of only planning for the next 10 to 20 years).

SITUATING POLICY FOR SEA-LEVEL RISE

The following re-classifies sea-level rise related policies according to geography, or situation, to assist in the next phase of the project. An assessment will be performed to identify the usefulness of policies in Tampa, matching projected sea-level rise impacts (according to the maps) to potential codes and regulations.

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Situations That Are Best Intended to Address

LOCATING SEA-LEVEL RISE REGULATIONS

CITY-WIDE

General

Development Limitations and Design Criteria

1. Protect flood storage capacity – using land development criteria and low density zoning to reduce the damage potential within the floodplain and help maintain flood storage and conveyance capacity. Set strict limits on the amount of impervious surfaces.
2. Preserve additional open space including forested areas, wildlife habitat areas, and wetlands.
3. Encourage private owners of infrastructure to conduct a climate change vulnerability assessment.
4. Demonstrate that drainage or pumping will not deplete groundwater or cause saltwater intrusion, in residential development on shorelines subject to tidal action.
5. Require the protection of sediment supplies and natural processes.

Incentives

6. Provide tax incentives or density bonuses to encourage developers to site new development in lower-risk areas of a lot or a subdivision.
7. Offer a Green Building Tax Credit to property owners who make “green” improvements to their buildings.

Government Mitigation

8. Utilize the Local Mitigation Strategy project list to mitigate future hazards.
9. Identify and fund drainage improvement projects.
10. Promote clustered, mixed-use development, site development around infrastructure, and preservation of open space.
    a. Consider upstream activities, as they directly affect tidal waters.
11. Increase and facilitate conservation incentives.
12. Monitor changes in acreage of land held for conservation and recreation use. Monitoring data and recommendations shall be included in the comprehensive plan implementation committee's annual report.
13. Give critical environmental area designation to areas of exceptional or unique character that have a benefit or threat to human health, a natural setting (e.g. fish or wildlife habitat, forest and vegetation, open space, and areas of important or scenic quality); agricultural, social, cultural, historic, archeological, recreational, or education values, or an inherent ecological, geological or hydrological sensitivity to change that may be adversely affected by any change.
14. Participate in the NFIP program, including the CRS, assist local municipalities who participate and make all reasonable efforts to maintain a Community Rating System (CRS) score of 5 or better.
15. Establish neighborhood level planning groups and/or representation.
16. Incorporate existing local and traditional knowledge in planning processes.
17. Outline an aggressive education program for citizens of all ages covering how planning for growth is key to environmental quality.
    a. Ensure communication materials and methods are accessible, in different languages and use traditional social media to engage with the community.
18. Establish a methodology to guarantee equity and fairness in any mitigation efforts.
19. Incentivize and fund the creation of affordable and resilient housing through a City-wide affordable housing strategy (equity).
20. Identify and protect local environmentally dependent economies.
21. Develop industry and transportation goals to reduce emissions. Monitor results for the elimination or calculated reduction of fossil fuel dependency.
22. Identify environmental carbon storage areas.
23. Promote alternative energy sources.
24. Improve energy efficient standards for public buildings.

    a. Require LEED or similar programs for government buildings.
25. Establish a goal to transition the county (or public buildings) to 100% clean energy.
26. Adopt a building energy benchmarking and disclosure policy.
27. Provide fast-track permitting, refund of permit fees, impact fee reduction and density bonuses for working with resiliency goals.
28. Coordinate transportation-related adaptation policies across jurisdictional boundaries and ensure consistency among broader planning and plan implementation efforts. Specifically, strategies for preparing for sea level rise.
29. Address potential impacts on the coastal aquifer from water quality changes and flooding of coastal and tidally influenced bodies of water that may occur due to more intense storms, higher surface water temperatures and rising sea levels.
30. Restore hydrologic eco-hydric function in the ecosystem, as feasible.
    a. Fund or undertake stream restoration and expansion projects for tidally influenced waterbodies.
31. Implement drainage improvement projects.

MUNICIPALLY OWNED LANDS

General

Development Limitations and Design Criteria

1. Public lands shall be efficiently used by combining public service activities, such as recreation, stormwater management and aquifer recharge areas and linking them into the greenway system, wherever possible.

THE COASTAL HIGH HAZARD ZONE (OR 'FLOODPLAIN PLANNING ZONE,' OR 'FLOOD RESILIENCY ZONE')

General

Definitions

1. Regulate the areas projected to be within the 100 year flood plain as a "Floodplain Planning Zone". (Somerset County, Maryland)
2. Establish the .02% flood area as a 'Flood Resiliency Zone.' (New York City)
    a. Allow the application of flood resistant zoning where any portion of the lot is touching the FIRM map designation 1% or the .02% annual chance floodplain instead of where touching the building (the current FEMA standard)
3. Located by the year 2100 high sea-level rise scenario plus the 1% flood event (in rainwater inches) (San Francisco)
4. Redefine riverine flood hazard zones to match projected expansion of flooding frequency and extent.
5. Designate Adaptation Action Areas (AAA) (state level law from 2011, the Community Planning Act) in order to identify areas that are vulnerable to the impacts of rising sea level.

Development Limitations and Design Criteria (General)

6. All new and proposed development must adequately address potential SLR impacts during the planning and permitting phase and develop a climate change adaptation plan as a condition for approval of any required permits.
7. Improve floodwalls around pump stations, flap or duckbill valves for storm drain outfalls and permanent or temporary pumps to discharge storm drainage systems over floodwalls.
8. Raise the elevation of low-lying utility equipment (such as pumping station)
9. Require destroyed structures, major damaged structures, and minor damaged structures to a post-storm survey and/or site plan of the lot and proposed structure, where the original structure was destroyed or where an increase in the footprint of the pre-storm structure is proposed; a site plan approval; on-site inspection of the lot by zoning administrator; all debris removed from the lot; a septic improvements permit; and certain setbacks dependent on the extent of damage.

10. Create stricter flood regulations for critical facilities (hospitals, fire stations, hazardous materials storage sites, etc.).
11. No new sites shall be permitted for heavy industrial uses along the shoreline of the coastal area unless such uses are water-dependent or water-related, or unless an overriding public interest is demonstrated.
12. Flood elevation certificates shall continue to be made available to the public and will be digitally entered into a geographic database to aid with assessment and other resiliency efforts.

Governmental Mitigation

13. Provide educational materials on flood-proofing buildings.
14. Provide public education to encourage retrofitting of structures that do not meet floodproofing or elevation, standards, based on continued remapping of flood probabilities, combined with financial assistance or incentives and stringent rebuild policies.
15. Assess sea level rise and storm surge vulnerability for new or modified capital projects, such as transportation planning, stormwater management, landfills, wastewater treatment plants and infrastructure siting. Locate future infrastructure outside of vulnerable areas (such as roads and water treatment facilities).
16. No new solid waste or hazardous waste management sites shall be approved for location in the coastal high hazard area.
17. Mitigate risks associated with toxic sites
18. Future land use maps will show all land located within the Velocity Zone and the Coastal A Zone, as designated by the Federal Emergency Management Agency.
19. Develop a coastal hazards website to provide information, including maps and data, to the public and government officials about coastal hazards.
20. Invest in a highly visible public outreach campaign.
21. Design all water supply and sanitary sewage systems to minimize or eliminate floodwater infiltration or discharges into floodwaters.

Building Height (Bottom)

22. Re-evaluate base finish floor elevation standards with respect to projected sea level rise scenarios and flooding potential.
    a. Increase building height 1' from what is required by Florida Building Code in flood-prone areas, to 2 feet above BFE.
    b. Require freeboard to be three feet above the designated FEMA Base Flood Elevation.
23. Provide incentives such as a rebate of $500 on building permit fees for inclusion of increased freeboard in the building design.

Building Height (Top)

24. Allow structures to exceed the existing 25 foot height limit by the number of feet needed to raise the house to BFE, plus a maximum credit of up to 4 feet above BFE. The maximum height for any structure is set at 15 feet above current limit.
    a. Allow height to be measured from the DFE, rather than from grade, to allow buildings to meet flood-resistant construction standards. In areas in which the BFE above grade equals or exceeds four feet, rules allow height restrictions to be measured from a reference plane located higher than the DFE – nine, 10 or 12 feet above grade depending on the building's use.

MEP

25. Require proposed central package systems to be designed and installed to recognize anticipated flooding and groundwater conditions.

Encroachments and Variances

26. Allow MEP equipment to be in the building bulkhead, as a permitted obstruction on required rear yards and open space, or within the building. When placed outside of the building, design requirements would ensure that the equipment is screened from view. When placed within the building, floor area rules would also allow

spaces used to access the MEP room and areas used for the storage of flood panels to be exempted from floor area calculations. Allow spaces used to access the MEP rooms and areas used for the storage of flood panels to be exempted from floor area calculations.

27. Modify minimum distance between building requirements to allow more flexibility for the construction of MEP buildings, facilitating new utility structures on larger campus-style housing sites.
28. Introduce flexibility to power systems, such as emergency generators, allowing them to encroach on side and rear yards and open space on a citywide basis for all building types.
29. Allow up to 500 square feet of floor area to be added to existing heavy commercial and manufacturing buildings.
30. Create specific development prohibition in floodplain areas. Examples include the prohibition of new sheds in the floodplain and prohibiting the expansion of the footprint of existing homes.

Electrical Systems

31. Require electrical equipment to be 2 feet above BFE.
    a. Require electrical panels to be at least 3 feet above the BFE.

Plumbing

32. Require 2 feet above the FEMA base flood elevation for plumbing equipment.

Septic Tanks

33. Review groundwater maps before allowing septic tanks to be installed
34. Prohibit cesspools, septic tanks, or other sewage devices, or any fuel storage device within 200 feet of a freshwater or tidal wetland or beach.
35. Designate areas where septic tanks and hazardous materials must be removed to prevent pollution of coastal waterbodies. A progression of this district based on sea level rise rates in conjunction with a grace period could be used to give property owners advance notice of the requirement.
36. Require removal of old tanks as a condition of property transfer or utility hook up.

Plan and Specification Requirements

37. Require subdivision sketch, preliminary and final plats to show the “Floodplain Planning Zone.”
38. Design buildings to have only a 0.5 percent chance of flooding in any year for the life of the structure.
39. All Environmental Impact Statements (EIS) must offer in-depth analysis of how the proposals will impact or be impacted by SLR; all favorable and adverse environmental impacts of the proposed use; a statement of the expected flood hazard present on the site; the means and costs necessary to minimize the adverse impacts; and identification of any irreversible commitment or alteration of natural features as a result of the proposed action.
40. Prohibit new construction of wood frame, multi-story, multi-family buildings.

Impact Fees

41. Implement an additional 2% tax on houses over a certain price, or within a certain area, and utilize this extra influx of tax money to increase spending on wetland conservation and sea level rise mitigation including additional bulkheads that are free of negative wetland impact.

Incentives

42. Provide incentives to encourage localities to increase regulations in floodplain above the minimum requirements of the NFIP.
43. Improve compliance with the City's Floodplain Ordinance, by enacting a strict penalty for violations.
44. Offer a Green Building Tax Credit to property owners who make “green” improvements to their buildings.

Design Standards

45. Provide exterior circulation for raised buildings
46. Single and two-family homes that elevate their first occupiable floor at or above five feet must either raise and plant the front yard, design a porch in front of the building, or design a stair turn and install planters to help alleviate blank walls.

Variances

47. Allow buildings on narrow lots to encroach into side lot buffer space.
48. Allow buildings to increase the degree of non-compliance due to resiliency work. As an example, a non-conforming attached home with non-compliant yards located within a residence district that only allows detached structures, would be able to relocate floor space currently located below the DFE to the top of the structure, even if the enlargement work increases the degree of non-compliance with yard regulations. Another example would be a non-conforming residence in a manufacturing district, which would be able to be elevated or retrofitted to or above the DFE, or be reconstructed, if located within areas that are predominantly residential.
49. Expand applicability of optional rules, so that property owners can build toward future conditions.
50. Allow areas used for internal ramps and stairs to be exempted from floor area calculations.
51. Modify use regulations for mixed-use buildings to provide more flexibility for the placement of commercial uses, such as storage space for businesses, to floors above the DFE even when not allowed through typical zoning standards.
52. Reduce side yard requirements if the lot is narrower than 30 feet (to a minimum of three Zoning for Coastal Flood Resiliency Cottage envelope 2013 Flood Text Underlying envelope feet); (b) reduce rear yard requirements if the lot is shallower than 95 feet (to a minimum of 10 feet); and (c) meet front yards and setbacks of neighboring buildings, to best align to surrounding neighborhood context. In exchange for this flexibility, the building would be limited to a maximum height of 25 feet, as measured from the reference plane, instead of 35 feet (most common maximum height in low-density districts).
53. Limit the intensity of permitted development to allow only limited residential, recreational, agricultural and commercial fishing uses within the 100-year floodplain.

Historic Buildings

54. Require floodproofing to the extent feasible while preserving the historic building exterior. Materials that can survive flooding should be used for interior renovations; when windows or doors are replaced, use floodproofing installation to the extent consistent with historic preservation goals.

Hazardous Materials

55. *Require storage of hazardous materials to be at least 3 feet above the BFE.*

Commercial Areas

1. Encourage new and existing commercial buildings to floodproof the ground floor while providing building access at grade, and design storefronts that are located at grade and are visually accessible at the sidewalk level.
2. Allow a small floor-area incentive for active uses to be kept at grade and dry-floodproofed to encourage retail continuity at street level. To ensure quality ground floors, this flood-area exemption would come with design controls, such as transparency requirements that meet dry-floodproofing regulations, and the condition that the ground floor be at least 13-feet high.

4% FLOODPLAIN

General

Development Limitations and Design Criteria

1. Prohibit habitable structures and major public and private investment within the existing/pre-development 25-year flood plain, except where a finding of overriding public interest has been reached.

Government Mitigation

2. Design all water supply and sanitary sewage systems to minimize or eliminate floodwater infiltration or discharges into floodwaters.

1% FLOODPLAIN

General

Definitions

1. Develop new 100 year stormwater elevation projections in the 100 year flood map for use in stormwater management permitting and other planning processes, which incorporate current and projected conditions for sea level rise.
    a. Assume the 100-year flood elevation to be equivalent to the Category Two storm surge elevation, until federal agencies can update their maps, which will vary depending on the waterway.

Development Limitations and Design Criteria

1. Revise zoning ordinance to prohibit residential development in the 100-year floodplain.
2. Disclose if the property is located in a special flood hazard area, any regulations that restrict development of the parcel, if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
    a. A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.
3. Require that for storm drains within the current or projected 100-year floodplain, backflow preventers be installed.

.02% FLOODPLAIN

General

Definitions

1. Use this zone as the Base Flood Elevation

(FUTURE) COASTAL FLOODPLAIN OVERLAY ZONE

General

Definitions

1. An area that includes the City's current base floodplain and areas projected to be within the base floodplain by 2050 (date was established in 2011), on the coast only.

Development Limitations and Design Criteria

2. Apply "VE" area coastal floodproofing standards, as provided in FEMA regulations, within the Coastal Floodplain Overlay Zone. State that for lots within both the overlay zone and the floodplain district, the more stringent requirements apply.
3. Require additional erosion controls or conservation easements within the district.
4. Prevent or mitigate through permits adverse effects on natural protective features such as dunes, bluffs, and vegetation, other existing erosion protection devices and significant fish and wildlife habitats and shellfish beds.
5. Require sellers to disclose to potential buyers that a property is located in an area vulnerable to sea level rise.
6. Disclose if the property is located in a special flood hazard area, any regulations that restrict development of the parcel, if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
    a. A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.

7. Integrate climate adaptation and habitat migration into standards for designing transportation infrastructure. Do not build roads within areas of projected sea-level rise.
8. Locate roads servicing new development above the base flood elevation.
9. Map streets and require planning for certain mapped roads to anticipate more frequent flooding.
    a. Create a list of streets that routinely flood.
10. Require more underdrains/cross-drains to allow for drainage.
11. Use more durable base materials for roads to withstand periodic flooding and improve road bedding as groundwater levels rise.

Government Mitigation

12. Encourage local building inspectors and conservation agents to work together to provide understandable advice to homeowners and commercial property owners about what can and cannot be built on coastal lots.
13. Provide inspection services to homeowners to help identify ways in which they could retrofit their homes to make them more resilient to sea-level rise.
14. Construct barriers to coastal floodwaters such as temporary flood walls, temporary dams, and improvements to the drainage system such as installation of backflow preventers on the city storm drain outflows into the bay.
15. Move city facilities that would be important in emergency operations (fire, police) out of flood-prone areas.
16. Identify and prioritize the protection of coastal habitats.
17. Place a priority on coastal land acquisition through the Florida Forever program.
18. Map facilities in the flood area that store hazardous materials.
19. Identify water infrastructure at risk from coastal flooding, sea level rise, and saltwater intrusion, such as surface or subsurface storage or transmission facilities, control structures, stormwater BMP's, water and wastewater treatment plants, and update this assessment every 5 years.
20. Encourage power generation facilities and power transmission infrastructure be sited and designed in a manner which takes into consideration impacts from climate change, including increasing winds, storm surge, ambient temperatures and sea-level rise.
21. Continue to evaluate the need and options for protecting historic structures and waterfront areas.
22. Provide planning and technical assistance to communities in hazardous or repetitive loss areas.
23. Increase road surface elevation standards, subsurface stabilization, stormwater management and drainage, and adjustment of bridge heights to allow for navigation, should be collaboratively assessed and implemented.
24. Include plans to facilitate tidal wetland migration in response to sea level rise.

WATERFRONT PROPERTY

General

Development Limitations and Design Criteria

1. Limit the development of oceanfront hotels and condominiums.
2. Specify the upland or landward portion of the lot to be developed while the low-lying portion is reserved for soft or natural flood protection.
3. Regulate land use activities within 250 feet of all tidal waters, great ponds, rivers, coastal wetlands, and non-forested freshwater wetlands of 10 acres of more, and within 75 feet of streams.
4. Require the developer to pay a fee to cover the costs of future armoring, to mitigate impacts to natural resources from future armoring, or to flood-proof infrastructure that services the new development.
5. Adopt policies requiring the removal of existing structures and the restoration of the site to its natural condition if waters rise to touch the structure for a specified amount (six) of consecutive months.

6. Require Coastal Erosion Management Permits for construction and other activities that occur within a designated erosion hazard area or for projects such as beach renourishment, rock revetments, landscaping, dune crossovers, or any structure in the jurisdictional areas and any modification to any such structure.
7. Permit erosion control structures that are likely to control erosion for at least 30 years and must be constructed of materials expected to last for 30 years, unless the maintenance program specifies otherwise.
8. Require coastal property owners to provide coastal hazard assessments to all potential buyers.
9. Integrate soft armoring (natural infrastructure) for roadways on the water's edge.
10. Require that new development and redevelopment for non-water-dependent uses abutting marine shorelines must include, in the site plan, beds of riparian vegetation in the 15-foot-wide strip of land lying immediately landward of unarmored shorelines or on the landward edge of shoreline armoring. Beds must be a minimum of six feet wide and ten feet long and must occupy a minimum of 50% of the shoreline's footage for new development and 25% for redevelopment.
    a. Identify salt-tolerant riparian species on the landscape plan and approved by a biologist/riparian plant specialist.
    b. Remove non-native species from planting beds.
    c. Encourage riparian vegetation.
11. Require Low Maintenance Zones (LMZ) to be established between developed areas and shorelines, contiguous to any waterbody, wetland or seawall, to reduce impacts of climate change and the negative effects of storm surge and tidal velocity, and the erosive effect of wave action.
12. Channelization or hardening of natural coastal shorelines and tidal creeks shall be prohibited except in cases of overriding public interest. Where the maintenance and or alteration of existing hardened shoreline is allowed, require mitigation of environmental impacts. Such mitigation may include, but is not restricted to, the installation of rip-rap appropriate living shorelines.
13. Minimize interference with beneficial natural shoreline processes such as water circulation, sand and gravel movement, and erosion and accretion. And that any use minimize the need for shoreline stabilization and flood protections.

Sea Walls

14. Condition approval of coastal development permits on a landowner's agreement not to build hard armoring. Landowners must show that soft armoring is not feasible before they will be issued a permit for hard a protective structure.
    a. Prohibit seawalls on the Gulf of Mexico except where there is imminent danger to existing buildings. (Collier County)
    b. Develop a standardized benefit-cost analysis model to justify and prioritize projects that fully compares the capital, societal, and natural resource benefits and costs of proposed shoreline protection projects and appropriate alternatives.
    c. Create a coastal erosion overlay district that prohibits the construction of new hard coastal armoring in certain areas. The ordinance requires projects within the district to be designed to control or prevent flooding and erosion using natural features of the coastline. In certain areas, erosion control structures can be built, but they require a special natural resources permit.
    d. Allow moveable structures in structural hazard areas, but the structure must be moved before the shore edge reaches 10 feet from the structure's waterward edge.
15. Require landowners to mitigate the impacts of permitted hard armoring. For example, landowners could be required to pay impact fees to mitigate damages to natural resources.
16. Develop criteria to require the removal of armoring under certain circumstances, such as when armoring is damaged by storms (consider a 50% rule or similar, or an overlay in the PDRP) or when it comes to encroach on public lands as the foreshore erodes.

17. Where permitted, shoreline protection projects shall withstand a 100-year flood event taking into account projected sea level rise for the life of the structure.
    a. Structures must be at least 5 feet above NAVD88.
    b. Require that the top of bulkheads and piers generally have a minimum elevation of 8.3 feet. Allow flexibility where this elevation is not feasible given the elevation of the specific property.
18. Seawalls must be in good repair or property owners will receive fines.
19. Remove structures that come to be located on an intertidal zone (seaward of the mean high tide line) for a period of six consecutive months.

Buffers and Setbacks

20. Require a 25-foot minimum vegetated buffer.. for all new non-beachfront shoreline development in the.. coastal zones.
21. Require a 30-foot buffer for development along estuarine shorelines.
    a. Require that development adjacent to the Bay include a 100-foot buffer measured inland from the edge of wetlands, shores, or streams.
22. Establish an erosion-based minimum setback for shoreline development based upon the (annual coastal erosion rate) x (a planning period representing the economic lifetime of the coastal structure) + (an additional buffer). Also utilize to set back structures from eroding shorelines to allow for beach preservation.
    b. Require a setback of 40 feet or greater + (70 times annual coastal erosion rate) + 20 feet for lot depths less than 140 feet
    c. Require a setback of (average lot depth)/2+40 feet, for lot depths of 140 feet to 200 feet
    d. Require a setback of 100 feet from shoreline for lot depths greater than 200 feet.
23. Allow a tiered setback based upon the size and type of structure.
    e. Setback smaller structures (less than 5,000 square feet) 30 times the erosion rate; larger structures must be set back 60 to 90 times the erosion rate based upon the size of the structure.
24. Allow for a variance if, after imposition of the setback, the lot does not have 30 feet of buildable space.

Parks

25. Take advantage of the Landscape Area Trust Fund to establish functional park space, to create a flexible coastline and mitigate the effects of sea-level rise.

Government Mitigation

26. Based on projected rates of sea level rise within the SLR planning horizon, inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.
27. Develop a comprehensive shoreline stabilization strategy to address protection of the built environment where it has been determined to be feasible and in the best interest of the City/County to protect economic investment and public and private infrastructure.
28. Compile a No Adverse Impacts Toolkit detailing floodplain management activities that communities can implement to increase their resilience to flood impacts and avoid potential liability.
29. Construct a publicly-accessible greenway trail along the coast. (education)

Areas on Open Water

Living Shorelines

30. Establish robust living shorelines that include mangroves and/or marshes

Living Breakwaters

31. Investigate and evaluate the effectiveness of living breakwater systems

Limited Waterways such as Canals

Living Shorelines

32. Support regeneration of living oyster reefs

WETLAND AREAS

General

Development Limitations and Design Criteria

1. Require subdivision standards when a parcel contains more than one acre of wetlands, 20% or more of the parcel is wetlands or within the Shoreline Zone, or a subdivision will alter 4,300 square feet or more of wetland if designed and developed in conventional layout.
2. Require a permit for any dredging, filling, construction, or other activity within or immediately adjacent to inventoried tidal wetlands which may substantially alter or impair the natural condition of the tidal wetland area.
3. Situate roads other infrastructure and most new construction at least 75 feet from a tidal wetland.
4. Monitor wetland boundary locations and based on this, gauge wetland movement and take appropriate measures to ensure that wetlands can naturally retreat rather than drown.
5. Require a permit for any construction that could affect the salt marsh, such as marinas, community docks, bridges, dredging and bank stabilizations.

Incentives

6. Streamline the building permit process for any resident who will voluntarily agree not to build any structures within 150 feet of a wetland and to not disturb its upper edge. This creates an incentive for residents ready to build.

Government Mitigation

7. Protect and improve existing wetlands.
    a. Assess wetland losses and identify suitable areas to accommodate sea level encroachment and conversion to new wetlands. Monitor changes in the total acreage of coastal wetlands and the extent of wetland communities.
    b. Prohibit removal, alteration, or encroachment within wetlands except in cases where no other practical alternatives exist that will permit a reasonable use of the land or where there is an overriding public benefit.
    c. Protect wetlands and watercourses from land development activities by requiring the establishment of natural area buffers adjacent to all post-developments and watercourses within a watershed overlay. Require Low Maintenance Zones (LMZ) to be established between developed areas and shorelines, contiguous to any waterbody, wetland or seawall, to reduce impacts of climate change and the negative effects of storm surge and tidal velocity, and the erosive effect of wave action.
    d. Establish coastal buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced or vulnerable water bodies. Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones where ecologically feasible.
    e. Utilize watershed management plans to protect landscape scale wetland conservation areas.
8. Eliminate invasive aquatic weeds and the protection of native plant communities; the development of integrated structural and non-structural shoreline protection measures; and development that does not change the composition of the beach and bottom substrate.

ESTUARY

General

Government Mitigation

1. Monitor changes in the volume of the commercial fish catch and the amount of fish and shellfish annually landed.

PROTECTION ZONE (SEA-LEVEL RISE VULNERABILITY AREA)

General

Definitions

1. Maintain a static shoreline position within the City/County.
2. This would include areas with critical infrastructure and dense development that have few options for adaptation. These areas, which may include town centers and historic districts, likely rely on existing hard armoring for flood protection and erosion control. Maintenance of existing hardened flood protection structures may be permitted while other resiliency practices are encouraged, such as employing green infrastructure for stormwater control.

Development Limitations and Design Criteria

3. Incorporate design criteria so that buildings will withstand a minimum service life of 50 years.
4. To acquire a permit, roads and sewer lines shall be elevated and evaluated to be more resilient to flood impacts.
5. Require well heads to be raised above the base food elevation plus a height to accommodate wave action on storm surge.
6. Disclose if the property is located in a special flood hazard area, any regulations that restrict development of the parcel, if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
    a. A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.

Properties Less Than 30 Feet Wide

7. Reduce side yard requirements to a minimum of 3 feet. In exchange for this flexibility, the building would be limited to a maximum height of 25 feet, as measured from the reference plane, instead of 35 feet (most common maximum height in low-density districts).

ACCOMMODATION ZONE (SEA-LEVEL RISE VULNERABILITY AREA)

General

Definitions

1. For moderately to intensely developed but non-critical areas, promotes development that considers future SLR. Includes downzoning to lower impact uses reduces risk exposure. Building codes are strengthened with setback, elevation, freeboard, and construction requirements; as well as limits on structure height and footprint size. Shoreline armoring is restricted to soft or natural solutions.

Development Limitations and Design Criteria

2. Promote natural shoreline migration, wetland transgression, improved water quality, and reduced exposure to erosion and storm damage through the use of shoreline vegetative buffers.
3. Set development densities or water-dependent use requirements to assist in coastal growth management and/or gradually move development out of high flood-risk areas.
4. Prohibit new subdivisions.
5. Incorporate design criteria so that buildings will withstand a minimum service life of 50 years.
6. To acquire a permit, roads and sewer lines shall be elevated and evaluated to be more resilient to flood impacts.
7. Subject pre-existing structures and uses to the zoning ordinance's non-conforming use provisions.
8. Permit taller buildings if the lowest floor is used as a "market hall", open community space, or parking.
9. Allow up to 6 feet of freeboard.

10. Prohibit use of bermed infiltration ponds for development on unimproved lots.
11. Require well heads to be raised above the base food elevation plus a height to accommodate wave action on storm surge.
12. Provide for the closure of inundated roads where an alternate route exists.
13. Provide for the termination of maintenance for roads that serve only a few occupied residences.
14. Disclose if the property is located in a special flood hazard area, any regulations that restrict development of the parcel, if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
    a. A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.

Government Mitigation

1. Establish a goal to substantially reduce or eliminate currently developed building sites subject to repetitive flood loss events. Strategies include purchasing properties, incentives, zoning requirements, impact fees and special assessments.
    a. Target sites that have been flooded three or more times in the last 10 years.
    b. Place a priority on coastal land acquisition through the Florida Forever program.
    c. Extend floodplain buyout programs to properties threatened by future sea level rise; governments can preemptively acquire developed properties in order to remove at-risk structures and restore floodplain function.

Subdivision Regulations and Clustering Development

15. Prohibit expansion of footprints on existing developed lots. Restrict major renovations of structures to cosmetic repairs, re-roofing, and replacement of appliances. Prohibit expansion or intensification of current uses, but allow ordinary maintenance and repair if damage to structures does not exceed 50 percent.
16. Require a significant portion of the subdivision be set aside for open space (e.g., at least 50% for a subdivision with sewer lines), and include wetland buffers, among other requirements.
17. Enact a Subdivision Ordinance that allows developers to increase the density of a development project by 10 percent if 40 percent of the acreage is set aside for conservation space.
18. Encourage subdivisions that promote high density development that maximizes efficient use of transportation and other public services, and the conservation of natural resources, habitat and open space.
19. Allow (or require) adjoining lots in common ownership to be combined into a single lot, prior to rebuilding after a storm.
20. Allow homeowners to relocate houses threatened by erosion to another location on their own property. Allows developers to subdivide if using deep lots that allow for coastal migration to occur.
21. Allow (or require) adjoining lots in common ownership to be combined into a single lot, prior to rebuilding after a storm.

Incentives

22. Amend conservation tax credit program to make the donation of unbuildable or threatened lots a more appealing option to homeowners.
23. Provide a one-time tax credit to landowners who voluntarily agree to preserve their property for conservation purposes.
24. Offer preferential assessments to landowners who agree to conserve their property for flood control or open space purposes. Landowners who donate easements would be assessed lesser property taxes based upon the loss of value caused by the easement terms limiting uses of the property.
25. Deduct up to 40 percent of the value of the easement from state income tax, for landowners who donate conservation easements. (not applicable in Florida)

26. Provide a one-time tax credit to property owners who move structures out of at-risk areas (either relocating on the same or a different parcel) or retrofit structures to be more resilient to flooding and surpass the minimum standards required by existing ordinances (i.e., the minimum required setbacks or building elevations).

Transferable Development Credits

27. Establish and calibrate a development credit market in a manner that gives affected landowners an incentive to transfer their development rights rather than build on threatened properties.
28. Require developers to acquire and extinguish a TDC from a substandard lot before they can get approval for a new subdivision.
29. Provide bonuses in receiving areas for suburban communities that can support more intense or dense uses in specific areas.

Rolling Easements

30. Propose the use of rolling easements as a wetlands protection policy in order to maintain water quality and sediment transport.

Areas Incurring 2' of SLR

Development Limitations and Design Criteria

31. Prohibit projects if, within 100 years, the property may reasonably be expected to be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a [two-]foot rise in sea level over 100 years.

Within 100 Cm of SLR

Development Limitations and Design Criteria

32. Treat structures that are vulnerable to 100 centimeters of sea level rise over the next 100 years as non-conforming structures.

Properties Less Than 30 Feet Wide

Buffers and Setbacks

1. Reduce side yard requirements to a minimum of 3 feet. In exchange for this flexibility, the building would be limited to a maximum height of 25 feet, as measured from the reference plane, instead of 35 feet (most common maximum height in low-density districts).

RELOCATION / CONSERVATION ZONE (SEA-LEVEL RISE VULNERABILITY AREA)

General

Definitions

2. Delineate a landward boundary for a Relocation/Conservation Zone.
    a. Use the 2050 inundation area (information taken from 2011).
    b. Designate resource conservation areas primarily for agriculture, forestry, fisheries, and habitat protection.
    c. In this area the goal is to reduce the density and intensity of future land use along unprotected shorelines. The City/County shall eliminate new investment in public infrastructure likely to be subject to the impacts of sea level rise within the planning horizon. Also, reduce residential land use densities targeting a specific amount of units or commercial square feet per acre. The City/County shall prohibit hard shoreline stabilization techniques (Sarasota is provided as a reference). Develop programs to encourage abandonment of undeveloped properties and relocation of existing structures.

Government Mitigation

3. Utilize long-term relocation by community zoning or land-use plans that identify a frontal zone of buildings likely to be impacted by known erosion rates or predicted flood levels from storm surge and coastal flooding.
4. Establish a goal to substantially reduce or eliminate currently developed building sites subject to repetitive flood loss events. Strategies include purchasing properties, incentives, zoning requirements, impact fees and special assessments.
    a. Target sites that have been flooded three or more times in the last 10 years.
    b. Place a priority on coastal land acquisition through the Florida Forever program.
    c. Extend floodplain buyout programs to properties threatened by future sea level rise; governments can preemptively acquire developed properties in order to remove at-risk structures and restore floodplain function.
5. Consider the future natural resource value of properties slated for acquisition.
6. Enact post-storm measures that include building moratoriums, policies on reconstruction, and a program for rapid acquisition of land.

Development Limitations and Design Criteria

7. Promote natural shoreline migration, wetland transgression, improved water quality, and reduced exposure to erosion and storm damage through the use of shoreline vegetative buffers.
33. Set development densities or water-dependent use requirements to assist in coastal growth management and/or gradually move development out of high flood-risk areas.
34. Prohibit new subdivisions.
35. Prohibit the construction of residential dwelling units in Conservation Zone and no building may be constructed in FEMA-designated V and V1-30 Zones.
36. Subject pre-existing structures and uses to the zoning ordinance's non-conforming use provisions.
37. Prohibit expansion of footprints on existing developed lots. Restrict major renovations of structures to cosmetic repairs, re-roofing, and replacement of appliances.
38. Provide for the closure of inundated roads where an alternate route exists.
39. Provide for the termination of maintenance for roads that serve only a few occupied residences.
40. Disclose if the property is located in a special flood hazard area, any regulations that restrict development of the parcel, if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.
    a. A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.
41. Prohibit erosion control structures if the City determines that 50% or more of the structure has been damaged.

Incentives

42. Amend conservation tax credit program to make the donation of unbuildable or threatened lots a more appealing option to homeowners.
43. Provide a one-time tax credit to landowners who voluntarily agree to preserve their property for conservation purposes.
44. Offer preferential assessments to landowners who agree to conserve their property for flood control or open space purposes. Landowners who donate easements would be assessed lesser property taxes based upon the loss of value caused by the easement terms limiting uses of the property.
45. Deduct up to 40 percent of the value of the easement from state income tax, for landowners who donate conservation easements. (not applicable in Florida)
46. Provide a one-time tax credit to property owners who move structures out of at-risk areas (either relocating on the same or a different parcel) or retrofit structures to be more resilient to flooding and surpass the

minimum standards required by existing ordinances (i.e., the minimum required setbacks or building elevations).

Transferable Development Credits

47. Establish and calibrate a development credit market in a manner that gives affected landowners an incentive to transfer their development rights rather than build on threatened properties.
48. Require developers to acquire and extinguish a TDC from a substandard lot before they can get approval for a new subdivision.
49. Provide bonuses in receiving areas for suburban communities that can support more intense or dense uses in specific areas.

Rolling Easements

50. Propose the use of rolling easements as a wetlands protection policy in order to maintain water quality and sediment transport.

Areas Incurring 2' of SLR

Development Limitations and Design Criteria

51. Prohibit projects if, within 100 years, the property may reasonably be expected to be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a [two-]foot rise in sea level over 100 years.

Within 100 Cm of SLR

Development Limitations and Design Criteria

52. Treat structures that are vulnerable to 100 centimeters of sea level rise over the next 100 years as non-conforming structures.

City of Tampa Florida

City Planning

Best Practices: Report #3
Sea Level Rise In Tampa: A Policy Approach

Examples From Communities Where It Is Used

fccd+r
florida center for community design and research

SEA LEVEL RISE AND REGULATION

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SEA LEVEL RISE AND REGULATION

POLICY DOCUMENT	DESCRIPTION	RESOURCE DOCUMENT, PLACE OR POLICY	I Implemented S Suggested		REFERENCE
COMPREHENSIVE PLAN					
Coastal Management Element					
Planning and Regional Goals					
Working Toward Future Sea-level Scenarios					
	Commit to adapt to dynamic coastal ecosystems. Develop a comprehensive strategy toward sea-level rise.	New York City, Boston, San Francisco	I	x	Ankersen et al., 2010; New York City Planning, 2020; City of Boston, 2019; San Francisco Planning, 2021; Grannis, 2011; Miller et al., 2020
	Evaluate risks from sea level rise in decisions involving land use along the waterfront and in coastal transition zones.	Annapolis Comprehensive Plan (2009); NYC Ocean and Great Lakes Ecosystem Conservation Program; King County, Washington: Executive Order on the Evaluation of Climate Change Impacts through the State Environmental Policy Act	I	x	Environmental Resources Management, 2011; Land Use Law Center, ND
	Establish the degree of sea level rise and time period to be considered when making land-use decisions (e.g., one foot by 2035). Be consistent with the Tampa Bay Regional Planning Council and the Climate Science Advisory Panel.	Comprehensive plans can be a powerful tool by which local governents can begin to incorporate recommendations from adaptation plans into the local framework for making land-use decisions.	S	x	Grannis, 2011; Tampa Bay Climate Science Advisory Panel, 2019; City of St Petersburg, 2019
	Require the integration of coastal erosion, coastal storm, and sea-level rise adaptation and response planning strategies into existing local policies and programs, including but not limited to: comprehensive planning, building codes, life-safety codes, emergency management, land development and zoning regulations, water resource management, flood control and storm water management, coastal management, and community development	In Maryland's adaptation strategy	S	x	Grannis, 2011; Miller et al., 2020; TBEP, 2020; Ankersen et al., 2010
	Develop a commission to advise toward sea-level rise	In (the state of) Maryland, an Executive Order requires the establishment of a commission, divided into three working groups: (1) Scientific and Technical Working Group, (2) Greenhouse Gas and Carbon Mitigation Working Group, and (3) Adaptation and Response Working Group (ARWG).	I	x	Miller et al., 2020
	Use flood hazard planning to address sea level rise and other climate change-related risks.	Washington Working Group	S	x	Grannis, 2011

			Preserve additional open space including forested areas, wildlife habitat areas, and wetlands.	James City County, Virginia		City-wide	Center for Coastal Resources Management, 2020
		Density Reduction in Sea-level Rise Zones					
			Reduce population and investments at risk through land use, zoning and population density regulations.	Anne Arundel County Background Report on Sea Level Rise, General Development Pan 2008. Maryland Jurisdictions		x	Environmental Resources Management, 2011
			Move city facilities that would be important in emergency operations (fire, police) out of flood-prone areas.			Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
			Develop design guidelines that promote compact development and redevelopment that maximizes the use of floodways and flood storage within the zone of accommodation			x	Southeast Florida Regional Climate Compact, 2019; FEMA, 2013; Ankersen et al., 2010
			Identify and establish a land bank for the purposes of relocating critically important infrastructure and municipal support facilities outside of the vulnerable area.			City-wide	Ankersen et al., 2010
			Place a priority on coastal land acquisition through the Florida Forever program. Acquisition efforts should be strategically targeted to protect coastal resources, reduce insured risk, and reduce the imapcts of climate change on both ecosystems and community.	Continuous park space may create optimal configurations for water storage and transference. These parks become green absorptive landscapes for collecting, filtering and dispersing waters. Regional stormwater system. Having floodable parks and green spaces alongside new and existing neighborhoods and development provides new amenities and elevates property values.		Coastal Floodplain Overlay Zone; All other flood-related overlay zones	Southeast Florida Regional Climate Compact, 2019; FEMA, 2013; City of Boston, 2019
			Evaluate cost comparisons of traditional relocation or relocation by demolition and rebuilding, against the long-term feasibility of continuing the replenishment option (near beaches).			N/A	Neal, 2019
			Develop a relocation strategy within 10 years and implement as necessary over the following century.			x	Neal, 2019
			Down-zone flood prone areas to encourage retreat, so that any redevelopment would be less dense. Non-conforming uses could be restricted from expanding or rebuilding.	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions	I	x	Environmental Resources Management, 2011
		Coordination Between Policy					
			Link community hazard mitigation plans to community comprehensive plans, incorporate into zoning, capital expenditure plans, and other local land-use management tools.	The Environmental Protection Agency (EPA) and National Oceanic and Atmospheric Administration (NOAA)	S	x	Grannis, 2011
			Public lands shall be efficiently used by combining public service activities, such as recreation, stormwater management and aquifer recharge areas and linking them into the greenway system, wherever possible.	City of Boston	I	Municipally Owned lands	FCCDR, 2020; City of Boston, 2019
			Consider the Tampa Bay Estuary Program Habitat Restoration Best Management Practices Manual, Habitat Masterplan Nitrogen Management for Planners, and Comprehensive Conservation and Management plan in planning practices and policy making.		S	x	FCCDR, 2020
			Base all new policy on scientific/coastal engineering literature/studies that have established benchmarks for natural rates of beach erosion.	Collier County, Florida: Conservation and Coastal Management Element	I	x	Land Use Law Center, ND
		Environmental Factors					
			Identify and prioritize the protection of coastal habitats.	NYC Ocean and Great Lakes Ecosystem Conservation Program	I	Coastal Floodplain Overlay Zone	Land Use Law Center, ND
			Consider upstream activities, as they directly affect tidal waters.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	City-wide	Land Use Law Center, ND

			Prevent or mitigate through permits adverse effects on natural protective features such as dunes, bluffs, and vegetation, other existing erosion protection devices and significant fish and wildlife habitats and shellfish beds.	New York's State Policy: Coastal Erosion Hazards Areas Program; NYC Ocean and Great Lakes Ecosystem Conservation Program	I	Coastal Floodplain Overlay Zone	Land Use Law Center, ND
			Require the protection of sediment supplies and natural processes.	New York's Local Waterfront Revitalization Program Policy, 15		City-wide	Land Use Law Center, ND
	Mapping and Inventory						
			Utilize best available technology to map areas likely to be inundated within 50 years, determine the economic value of threatened resources, prepare a plan to protect the most important resources; and finally develop local plans for sea level rise protection programs. Identify potential sea level rise impacts (e.g., erosion, flooding, high wind, wave action and storm surge).	San Francisco, California: San Francisco Bay Conservation and Development Commission; Long Island South Shore Reserve's Comprehensive Management Plan: Implementation Chapter	I	All SLR Vulnerability Areas	Environmental Resources Management, 2011; Grannis, 2011; Land Use Law Center, ND; Broward County, 2015
			Map certain undeveloped areas within the 250 foot shoreland zone as resource protection districts. These include 100-year floodplains on rivers or tidal waters; areas adjacent to freshwater wetlands, salt marshes, and salt meadows, areas with two or more acres of steep slopes (+20%), areas with two or more acres of wetland vegetation and areas on rivers or tidal water subject to severe bank erosion.	Maine: Mandatory Shoreland Zoning Act	I	x	Land Use Law Center, ND
			Analyze vulnerability to facilities and services, to sea level rise within the SLR planning horizon, inlcuding but no limited to: buildings; water and wastewater treatment plants, transmission lines and pumping stations; stormwater systems; roads, rail, bridges, and all transportation and transit infrastructure; power generation facilities and power transmission infrastructure; critical airport and seaport infrastructure; hospitals; city halls, police and fire stations. Determine whether such buildings and structures should be protected through shoreline stabilization.	Portsmouth Virginia Floodplain Management Plan and Repetitive Loss Plan. 2010	I	All SLR Vulnerability Areas	Ankersen et al., 2010; Environmental Resources Management, 2011; Broward County, 2015; San Francisco Planning, 2021; San Francisco Planning, 2021
			Identify properties that are coastal or estuarine, have a significant conservation, recreation, ecological, historical, or aesthetic values, or be threatened by conversion from their natural or recreational state to other uses, to receive federal funds to fund acquisitions.	NOAA Coastal and Estuarine Land Conservation Program (CELCP)	I	Coastal Floodplain Overlay Zone	Grannis, 2011
			Map facilities in the flood area that store hazardous materials			Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
			Include periodic review of current and projected sea levels, to review boundaries regularly and compare with flood history. These should be accomplished on the same cycle as the city's comprehensive plan; i.e., approximately every 5-7 years.			x	Environmental Resources Management, 2011
			Support local and regional mapping, modeling and monitoring programs to assure the most current and locally-specific data on climate change vulnerability and sea-level rise is available. This includes impacts on groundwater levels, saltwater intrusion, and drainage infrastructure.			x	TBEP, 2020; Sheehan et al., 2016
			Use new technologies to more easily visualize risk.	The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011		x	Environmental Resources Management, 2011
			Designate priority funding areas appropriate for future growth.	Maryland Growth Act and Smart Growth Initiative	I	x	Grannis, 2011
			Develop maps showing where soft armoring is feasible and regulations to govern permitting of shoreline protective structures.	Maryland Living Shoreline Protection Act	I	Waterfront Properties	Grannis, 2011

			Categorize different types of estuarine shorelines (swamp forest, marsh, low sediment bank) based upon how well each maximizes ecosystem functions (storm buffer, filtration of runoff, habitat). Then recommend different types of shoreline stabilization methods (land planning, beach fill, vegetation control, groins, sills) in consideration of the potential impacts of each method on the different types of shorelines.	The North Carolina Estuarine Biological and Physical Processes Work Group and Division of Coastal Management	S	Waterfront Properties	Grannis, 2011
			Assess forest loss and identify reforestation sites outside the sea level risk zone.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		City-wide	Environmental Resources Management, 2011
			Based on projected rates of sea level rise within the SLR planning horizon, inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.			Waterfront Properties	Ankersen et al., 2010
			Identify water infrastructure at risk from coastal flooding, sea level rise, and saltwater intrusion, such as surface or subsurface storage or transmission facilities, control structures, stormwater BMP's, water and wastewater treatment plants, and update this assessment every 5 years.			Coastal Floodplain Overlay Zone	FCCDR, 2020
			Assess wetland losses and identify suitable areas to accommodate sea level encroachment and conversion to new wetlands. Monitor changes in the total acreage of coastal wetlands and the extent of wetland communities.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions. Escambia County, Florida: Coastal Conservation and Management Element		Wetland Areas	Environmental Resources Management, 2011; Land Use Law Center, ND
			Monitor changes in the volume of the commercial fish catch and the amount of fish and shellfish annually landed.	Escambia County, Florida: Coastal Conservation and Management Element	I	Estuary	Land Use Law Center, ND
			Monitor changes in acreage of land held for conservation and recreation use. Monitoring data and recommendations shall be included in the comprehensive plan implementation committee's annual report.	Escambia County, Florida: Coastal Conservation and Management Element	I	City-wide	Land Use Law Center, ND
			Give critical environmental area designation to areas of exceptional or unique character that have a benefit or threat to human health, a natural setting (e.g. fish or wildlife habitat, forest and vegetation, open space, and areas of important or scenic quality); agricultural, social, cultural, historic, archeological, recreational, or education values, or an inherent ecological, geological or hydrological sensitivity to change that may be adversely affected by any change.	Environmental Review under State Environmental Policy Act (SEQRA)	I	City-wide	Land Use Law Center, ND
			Develop new 100 year stormwater elevation projections in the 100 year flood map for use in stormwater management permitting and other planning processses, which incorporate current and projected conditions for sea level rise.		I	1% Floodplain	Broward County, 2015
	Overlay Zones						
			Utilize overlay zones to protect citizens' investments, restore water quality and protect habitat.	The Chesapeake Bay Critical Area	I	x	Grannis, 2011; Ankersen et al., 2010
			Designate Adaptation Action Areas (AAA) in order to identify areas that are vulnerable to the impacts of rising sea level.		I	Coastal High Hazard Area	Broward County, 2015
		Norfolk Planning Areas					
			New Urban Centers (High asset value, low flood risk)	Norfolk Vision 2100	I	x	City of Norfolk, 2016
			Neighborhoods of the Future (Low asset value, low flood risk)	Norfolk Vision 2101	I	x	City of Norfolk, 2017
			Enhanced Economic Engines (High asset value, high flood risk)	Norfolk Vision 2102	I	x	City of Norfolk, 2018
			Areas of Adaptation (Low asset value, high flood risk)	Norfolk Vision 2103	I	x	City of Norfolk, 2019
	Future Development: Approvals, Reviews, Limitations and Restrictions						

		Private					
			All new and proposed development must adequately address potential SLR impacts during the planning and permitting phase and develop a climate change adaptation plan as a condition for approval of any required permits.	Virginia Governor's Commission	S	Coastal High Hazard Area	Grannis, 2011
			Promote clustered, mixed-use development, site development around infrastructure, and preservation of open space.	Maryland Growth Act and Smart Growth Initiative; California Adaption Strategy	I	City-wide	Grannis, 2011
			Limit development where it cannot include sufficient setbacks to mitigate impacts from sea level rise over the life of the structure.	Implementation of Setbacks/Buffers in a SLR Context	S	x	Grannis, 2011
			Require that development, including the construction or erosion control structures, must not measurably increase erosion or flooding at the site or at other locations.	New York's Local Waterfront Revitalization Program Policy 14; The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011	I	Areas of Relocation and Accomodation	Land Use Law Center, ND Environmental Resources Management, 2011
			Provide public and market-based incentives/disincentives to reduce property damage	Anne Arundel County Background Report on Sea Level Rise, General Development Pan 2008. Maryland Jurisdictions	S	All SLR Vulnerability Areas	Environmental Resources Management, 2011
			Articulate a "40 year policy", that establishes a preference for preserving the coastline by requiring the gradual relocation of development away from the coast.	South Carolina Beachfront Management Act	I	Areas of Relocation	Grannis, 2011
			Prohibit habitable structures and major public and private investment within the existing/pre-development 25-year flood plain, except where a finding of overriding public interest has been reached. This policy shall not preclude the development of water-dependent uses, water-related and water-enhanced uses, stormwater management structures, non-habitable structures, and passive recreational uses where appropriate.		S	.4% Floodplain	FCCDR, 2020
			No new sites shall be permitted for heavy industrial uses along the shoreline of the coastal area unless such uses are water-dependent or water-related, or unless an overriding public interest is demonstrated.		S	Coastal High Hazard Area	FCCDR, 2020
			Limit the development of oceanfront hotels and condominiums.	Nags Head, North Carolina: managed retreat at work	I	Waterfront Properties	Neal, 2019
		Public					
			Assess sea level rise and storm surge vulnerability for new or modified capital projects, such as transportation planning, stormwater management, landfills, wastewater treatment plants and infrastructure siting. Locate future infrastructure outside of vulnerable areas (such as roads and water treatment facilities).	Maryland Working Group	S	Coastal High Hazard Area	Grannis, 2011; Broward County, 2015
			Abandon, relocate, raise, floodprood or seal any infrastructure that will sustain damage by inundation, including city utilities.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions	S	Areas of Relocation and Accomodation	Environmental Resources Management, 2011
			Limit or prohibit public expenditures to build or maintain infrastructure in the 100-year, the 500- year floodplains, in areas highly vulnerable to climate change effects or areas in the SLR District.	Virginia Governor's Commission; Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions	S	Areas of Relocation and Accomodation	Grannis, 2011; Environmental Resources Management, 2011
			No new solid waste or hazardous waste management sites shall be approved for location in the coastal high hazard area.		S	Coastal High Hazard Area	FCCDR, 2020

			Encourage power generation facilities and power transmission infrastructure be sited and designed in a manner which takes into consideration impacts from climate change, including increasing winds, storm surge, ambient temperatures and sea-level rise.			Coastal Floodplain Overlay Zone	FCCDR, 2020
		Coastal Erosion Hazard Area					
			Identify coastal erosion hazard areas. Activities, development or other action in these erosion hazard areas should be undertaken to minimize damage to property, and prevent the exacerbation of erosion hazards.	New York's State Policy: Coastal Erosion Hazards Areas Program	I	Waterfront Properties	Land Use Law Center, ND
			Permit erosion control structures that are likely to control erosion for at least 30 years and must be constructed of materials expected to last for 30 years, unless the maintenance program specifies otherwise.	New York's State Policy: Coastal Erosion Hazards Areas Program	I	Waterfront Properties	Land Use Law Center, ND
			Prohibit erosion control structures if the City determines that 50% or more of the structure has been damaged.	Town of Sullivan's Island, South Carolina: Beach Preservation; Recreation and Conservation Area Districts	I	Areas of Relocation	Land Use Law Center, ND
			Prohibit enlargement or strengthening of damaged structures beyond their pre-damage condition.	Town of Sullivan's Island, South Carolina: Beach Preservation; Recreation and Conservation Area Districts	I	Areas of Relocation	Land Use Law Center, ND
	Mitigation and Construction						
			Create a schedule for implementation of mitigation strategies and capital improvement projects.		S	x	Grannis, 2011
			Determine the costs and benefits of public decision-making in mitigating property damage.	Annapolis Comprehensive Plan (2009)		x	Environmental Resources Management, 2011
			Continue to evaluate the need and options for protecting historic structures and waterfront areas.			Coastal Floodplain Overlay	Environmental Resources Management, 2011
			Develop a process to improve coordination with the U.S. Army Corps of Engineers, state agencies, and municipalities and achieve permit requirements in a timely manner, so as to ensure that all dredged material suitable for beach nourishment will be placed on adjacent or nearby eroding public beaches.	Massachussetts Coastal Hazards Commission	S	x	Grannis, 2011; Klijn et al., 2012
			Identify and fund drainage improvement projects.	Portsmouth Virginia Floodplain Management Plan and Repetitive Loss Plan, 2010		City-wide	Environmental Resources Management, 2011
			Develop a comprehensive shoreline stabilization strategy to address protection of the built environment where it has been determined to be feasible and in the best interest of the City/County to protect economic investment and public and private infrastructure.			Waterfront Property	Ankersen et al., 2010
			Mitigate risks associated with toxic sites			Coastal High Hazard Area	The Nature Conservancy and Southeast Florida Regional Compact for Climate Change, 2014
			Offer financial assistance to landowners to relocate or remove encroaching structures.	Texas Open Beaches Act	I	Areas of Relocation	Grannis, 2011
			Plan for community infrastructure such as roads, schools, public safety and medical facilities, water and wastewater systems, gas, elextrical and communication utilities to ensure public safety.	Anne Arundel County Background Report on Sea Level Rise, General Development Pan 2008. Maryland Jurisdictions; Portsmouth Virginia Floodplain Management Plan and Repetitive Loss Plan, 2010		City-wide	Environmental Resources Management, 2011
	Buffer Zones and Setbacks						
			Consider the adequacy of existing coastal, floodplain setbacks and buffer zones and whether these are adequately protecting the region's coastal features, river channels and shorelines.	Florida Action Team; The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011; Implementation of Setbacks/Buffers in a SLR Context	S	x	Grannis, 2011; Environmental Resources Management, 2011; Grannis, 2011

			Use and require buffers in areas with sufficient buildable spaces, to protect against flood risks and water quality impacts posed by sea level rise, prohibit construction and significant redevelopment in areas that will likely be impacted by sea level rise, and increase buffer widths to account for future inundation and erosion or protect natural resources.	Chesapeake Bay Preservation Act (CBPA) Town of Sullivan's Island, South Carolina: Beach Preservation; Recreation and Conservation Area Districts; Pacific County, Washington: SMP Ocean Coast Requirements; Implementation of Setbacks/Buffers in a SLR Context; California Adaptation Strategy	S	Areas of Accomodation and Relocation	Grannis, 2011; Land Use Law Center, ND
			Require an erosion-based setback or modify existing buffer provisions by expanding the distance of vegetated buffers in areas experiencing significant erosion (two or more feet per year) and prohibit construction of new coastal armoring.	South Carolina Beachfront Management Act; Maryland Working Group	I	All SLR Vulnerability Areas	Grannis, 2011
			Require Low Maintenance Zones (LMZ) to be established between developed areas and shorelines, contiguous to any waterbody, wetland or seawall, to reduce impacts of climate change and the negative effects of storm surge and tidal velocity, and the erosive effect of wave action.		S	Waterfront Properties	FCCDR, 2020
			Promote natural shoreline migration, wetland transgression, improved water quality, and reduced exposure to erosion and storm damage through the use of shoreline vegetative buffers.	South Carolina Shorelline Change Advisory Committee	S	Areas of Accomodation and Relocation	Grannis, 2011
			Require large buffers for large-scale development projects.	Implementation of Setbacks/Buffers in a SLR Context	S	Waterfront Properties	Grannis, 2011
	Repetitive Loss						
			Establish a goal to substantially reduce or eliminate currently developed building sites subject to repetitive flood loss events.	Florida Action Team	S	Areas of Accomodation and Relocation	Grannis, 2011
			Target sites that have been flooded three or more times in the last 10 years for future use conversion to reduce the human risk or the potential for property damage.	Florida Action Team	S	Areas of Accomodation and Relocation	Grannis, 2011
	Acquisition and Removal						
		Easements					
			Utilize shoreline protection prohibition and conservation or rolling easements to prevent development in areas that are vulnerable to sea level rise	Implementation of Conservation Easements in a SLR Context; Florida, New Jersey and Virginia	S	Areas of Accomodation and Relocation	Grannis, 2011; Donaldson, 2019; Pinellas County, 2017; EPA, 2011; Ankersen et al., 2010
			Reevaluate the existing conservation easement programs to ensure that properties in vulnerable areas are eligible to receive tax credits, to ensure that property owners have sufficient incentive to sell or dedicate easements and acquire additional conservation easements along the coast to reduce development in flood prone areas that impedes the migration of coastal resources.	North Carolina Steering Committee; Maryland Environmental Trust; Implementation of Rolling Conservation Easements in a SLR Context	S	Areas of Accomodation and Relocation	Grannis, 2011
			Have agencies prioritize vulnerable properties and purchase conservation easements across parcels that have particular utility as habitat or natural buffers, or where ecosystems can migrate inland as the seas rise.	Implementation of Conservation Easements in a SLR Context; Maryland	S	Areas of Accomodation and Relocation	Grannis, 2011; Ankersen et al., 2010
			Utilize matching federal funds from NOAA Coastal and Estuarine Land Conservation Program (CELCP) to purchase conservation easements from coastal property owners.	NOAA Coastal and Estuarine Land Conservation Program (CELCP)	I	Areas of Accomodation and Relocation	Grannis, 2011
		Property Purchase					
			Identify properties for potential buy-out in order to conserve natural resources, such as wetlands and beaches, provide upland migration corridors, preserve habitat, threatened coast lands or provide flood buffers for existing development. Rank them in order of level of immediate risk.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions; Implementation of Acquisitions and Buyout Programs in a SLR Context; EPA		Areas of Accomodation and Relocation	Environmental Resources Management, 2011; Grannis, 2011

			Extend floodplain buyout programs to properties threatened by future sea level rise; governments can preemptively acquire developed properties in order to remove at-risk structures and restore floodplain function.	Implementation of Acquisitions and Buyout Programs in a SLR Context	S		Grannis, 2011
			Consider the future natural resource value of properties slated for acquisition. Although some dry lands may not have current natural resource value, perservation may nonetheless be justified because the land could provide room for wetlands to migrate inland in the future.	Implementation of Acquisitions and Buyout Programs in a SLR Context	S	Areas of Accomodation and Relocation	Grannis, 2011
			Place a priority on coastal land acquisition through the Florida Forever program. Acquisition efforts should be strategically targeted to protect coastal resources, reduce insured risk, and reduce the imapcts of climate change on both ecosystems and communities.	Florida Action Team	S	Areas of Accomodation and Relocation	Grannis, 2011
			Have coastal communities use property taxes generated by the state Community Preservation Act to fund acquisition of storm-prone properties.	Massachussetts Coastal Hazards Commission	S	Areas of Accomodation and Relocation	Grannis, 2011
			Evaluate ways to integrate sea level rise into grant-funded acquisitions of estuaries in partnership with NOAA's Coastal and Estuarine Land Conservation Program.	Washington Department of Ecology	I	Areas of Accomodation and Relocation	Grannis, 2011
		Transfer of Development Rights					
			Consider using transferable development rights to compensate landowners for development restrictions (used in conjunction with land-use regulations), as financial compensation or as incentives.	EPA; Dade County, Florida, has used TDCs to preserve over 100,000 acres of everglades outside of the Everglades National Park. Properties adjacent to the park flood periodically and, therefore, cannot be developed. To provide some financial compensation, the county allocated owners Severable Use Rights (or TDCs) that can be sold to increase the intensity or density on upland parcels. Implementation of Transferable Development Credits in a SLR Context	S	Areas of Accomodation and Relocation	Grannis, 2011; Southeast Florida Regional Climate Compact, 2019; Donaldson, 2019
	Shoreline Stabilization, Erosion Control and Sea Walls						
			Discourage the building of seawalls and development right on the shoreline or in flood prone areas and encourage alternatives.		S	Areas of Accomodation and Relocation	Jacobsen, 2019
			Work with regional partners, including the Estuary Program, SWFWMD, the Hillsborough County Environmental Protection Commission and Sea Grant, to explore the feasibility of replacing hardened shorelines with natural shoreline stabilization methods.			Areas of Accomodation and Relocation	FCCDR, 2020
			Require a living shorelines buffer where appropriate and ecologically feasible. For example: a. Provide robust living shorelines in areas with access to open waters b. Provide infrastructure for oysters in limited waterways such as canals			Waterfront Properties	Ankersen et al., 2010; Boland, 2019
			Incorporate living coastlines into storm surge reduction projects, as feasible. a. Strategy: Support regeneration of living oyster reefs b. Strategy: Support regeneration of coastal wetlands, such as mangroves and marshes. c. Investigate and evaluate the effectiveness of living breakwater systems			Waterfront Properties	FCCDR, 2020

			Adopt shoreline protection policies that emphasize the use of living shorelines and seek to avoid shoreline hardening where feasible in order to allow for the potential migration of tidal wetlands and increase coastal resiliency.	Virginia Governor's Commission	S	Waterfront Properties	Grannis, 2011
			Require that improvements made to protect a person's property from shoreline erosion use living shoreline or non-structural shore protection practices wherever technologically and ecologically appropriate.	In Maryland's adaptation strategy. Also Cedar Key. "Living shorelines provide erosion control benefits while also enhancing the natural shoreline habitat."		Waterfront Properties	Miller et al., 2020
			Reduce and discourage future reliance on bulkheading/hardening to stabilize estuarine and beach shorelines. Shoreline hardening should be considered only after a full and cumulative assessment of short- and long- term impacts to coastal resources and coastal ecosystems.	Floida Action Team; Town of East Hampton, NY: Coastal Management Element	S	Waterfront Properties	Grannis, 2011; Land Use Law Center, ND
			Develop a standardized benefit-cost analysis model to justify and prioritize projects that fully compares the capital, societal, and natural resource benefits and costs of proposed shoreline protection projects and appropriate alternatives.	Massachussetts Coastal Hazards Commission; North Carolina Ocean Policy Steering Committee	S	Waterfront Properties	Grannis, 2011
			Limit or ban the use of hard armoring in certain vulnerable areas of the coast.	Maine, North Carolina, Rhode Island, and Texas	I	Waterfront Properties	Grannis, 2011
			Prohibit placement of erosion control structures, such as bulkheads, which may result in undesireable cumulative impacts, limit shoreline migration and in cases where erosion control structures are approved, alternatives to traditional bulkheads may be preferred.	South Carolina Shoreline Change Advisory Committee; New York's Local Waterfront Revitalization Program Policy 17; EPA	S	Waterfront Properties	Grannis, 2011; Land Use Law Center, ND
			Compile a No Adverse Impacts Toolkit detailing floodplain management activities that communities can implement to increase their resilience to flood impacts and avoid potential liability.	The Association of Floodplain Managers	I	Waterfront Properties	Grannis, 2011
			Avoid disturbance of natural shorelines that provide stabilization and protect landward areas		S	Waterfront Properties	FCCDR, 2020
			Channelization or hardening of natural coastal shorelines and tidal creeks shall be prohibited except in cases of overriding public interest. Where the maintenance and or alteration of existing hardened shoreline is allowed, require mitigation of environmental impacts. Such mitigation may include, but is not restricted to, the installation of rip-rap appropriate living shorelines.		S	Waterfront Properties	FCCDR, 2020
			Minimize interference with beneficial natural shoreline processes such as water circulation, sand and gravel movement, and erosion and accretion. And that any use minimize the need for shoreline stabilization and flood protections.	City of Bainbridge Island, Washington: Shoreline Management Program	I	Waterfront Properties	Land Use Law Center, ND
			Prohibit activities that may cause man-induced shoreline erosion beyond the natural beach erosion cycle or that would deteriorate the beach and dune system.	Collier County, Florida: Conservation and Coastal Management Element	I	N/A	Land Use Law Center, ND
			Prohibit seawalls on the Gulf of Mexico except where there is imminient danger to existing buildings.	Collier County, Florida: Conservation and Coastal Management Element	I	Waterfront Properties	Land Use Law Center, ND
	Building Code						
			Conform all development to Florida Building Code. This includes flood-resistant construction requirements in the Florida Building Code and applicable floodplain management regulations set forth in 44 C.F.R. part 60, or more stringent controls, shall continue to be applied to development and redevelopment in the coastal storm area.			Existing, City-wide	FCCDR, 2020

			Require all development within the 100 year flood plain to be in strict conformance with all applicable federal, state, regional and local development regulations.			Existing, 1% Flood Area	FCCDR, 2020
			Re-evaluate base finish floor elevation standards with respect to projected sea level rise scenarios and flooding potential.			Coastal High Hazard Area	Broward County, 2015
	National Flood Insurance Program						
			Participate in the NFIP program, including the CRS, assist local municipalities who participate and make all reasonable efforts to maintain a Community Rating System (CRS) score of 5 or better.	Hillsborough County, proposed		City-wide	FCCDR, 2020
	Property Disclosure						
			Flood elevation certificates shall continue to be made available to the public and will be digitally entered into a geographic database to aid with assessment and other resiliency efforts.			Coastal High Hazard Area	FCCDR, 2020
			Future land use maps will show all land located within the Velocity Zone and the Coastal A Zone, as designated by the Federal Emergency Management Agency.			Coastal High Hazard Area	FCCDR, 2020
			Require sellers to disclose to potential buyers that a property is located in an area vulnerable to sea level rise.	Implementation of Real Estate Disclosures in a SLR Context; Maryland Working Group	S	Coastal Floodplain Overlay Zone	Grannis, 2011; Ankersen et al., 2010
			Consider a law requiring landowners to disclose any regulations that restrict development of the parcel such as setbacks and removal requirements. Additionally alert buyers of erosion rates, storm history, sea level rise concerns and other relevant information.	Implementation of Real Estate Disclosures in a SLR Context; Florida Action Team; South Carolina Shoreline Change Advisory Committee	S	Coastal Floodplain Overlay Zone	Grannis, 2011
			Encourage insurance companies to provide policyholders with greater disclosure about climate risk. Insurance companies need to adequately inform their customers and shareholders about the risks climate change poses to the insurance business and the ability of the industry to pay policyholders' claims.	Florida Action Team	S	x	Grannis, 2011
	Government Strategies						
		Funding					
			Review funding levels for local grant programs, to assure that there is adequate funding to respond to the emerging need for sea level rise planning.	Washington Working Group	S	x	Grannis, 2011
			Coordinate resiliency efforts to meet opportunities and criteria established by state and federal funding programs		S	x	Florida Housing Coalition, 2019
			Dedicate funds for the conservation of wetlands or other natural areas to receive matching grants from the U.S. Fish and Wildlife Service National Coasstal Wetlands Conservation Grant Program, for acquisition, restoration, management or enhancement of coastal wetlands.	U.S. Fish and Wildlife Service National Coastal Wetlands Conservation Grant Program	I	x	Grannis, 2011
			Seek funding for the acquisition of abandoned properties and undeveloped land in the coastal areas for increased passive recreation, open space and restoration to its natural state. This can include the utilization of programs such as the Flood Mitigation Assistance Program (FMAP), Repetitive Flood Claims (RFC) and Severe Repetitive Loss (SRL), work with the State of Florida Division of Emergency Management (DEM), the Federal Emergency Management Agency (FEMA) and the National Flood Insurance Program (NFIP).		S	x	FCCDR, 2020
		Coordination					
			Coordinate with the City's Hazard Mitigation Plan	Annapolis Comprehensive Plan (2009)	I	x	Environmental Resources Management, 2011

			Coordinate with other government agencies on research needs related to sea level rise. Develop a resiliency plan that aligns with other goals and visions across all agencies and in collaboration with other municipalities where applicable	Annapolis Comprehensive Plan (2009)	I	x	Environmental Resources Management, 2011; City of St. Petersburg, 2019
			Work in collaboration with the Tampa Bay Regional Resilience Coalition to establish regional standards and priorities for sea level rise and flood		S	x	Southeast Florida Regional Climate Compact, 2019; Cutter et al., 2008
			Allow for the adoption of consistent comprehensive plans, zoning laws, and other land use regulations through Intermunicipal Agreements (IMA), a cooperative or contractual agreement between two or more municipalities.	New York State regional planning is the result of voluntary intermunicipal agreements	I	x	Land Use Law Center, ND
			Establish a coordinated multi-county estuary reserve act to protect and manage the estuary system as a single integrated estuary. Develop a reserve-wide hydrologic model that measures groundwater underflow, tributary inputs, circulation and ocean-bay exchanges, to predict water quality impacts of flooding, erosion and sea level rise.	Long Island South Shore Estuary Reserve Act; Long Island South Shore Reserve's Comprehensive Management Plan: Implementation Chapter; City of St. Pete, Florida: Coastal and Conservation Element	I	x	Land Use Law Center, ND
			Develop model codes and policies to encourage post-hazard redevelopment in areas with less vulnerability to storm surge, inundation, flooding, sea level rise and other impacts of climate change, and incentivize locally appropriate mitigation and adaptation strategies.		I	x	Broward County, 2015
		Design Review					
			Establish a multidisciplinary quality review team, with a focus on integration and design.		I	x	Klijn et al., 2013; FCCDR, 2020
	Social Factors						
		Participation					
			Establish neighborhood level planning groups and/or representation.	In the City of Bradford, in the UK, Flood Local Action Plans (FLAPs) reduced the implementation scope to a neighborhood scale.		City-wide	Cashman, 2011
			Incorporate existing local and traditional knowledge in planning processes.			City-wide	Thornton & Scheer, 2012
		Education					
			Develop a coastal hazards website to provide information, including maps and data, to the public and government officials about coastal hazards.	Connecticut	I	Coastal High Hazard Area	Grannis, 2011; City of St. Petersburg, 2019; Southeast Florida Regional Climate Compact, 2019
			Construct a publicly-accessible greenway trail along the coast.	James City County, Virginia	I	Waterfront Properties	Center for Coastal Resources Management, 2020
			Provide planning and technical assistance to communities in hazardous or repetitive loss areas.		I	Coastal Floodplain Overlay Zone	City of St. Petersburg, 2019
			Outline an aggressive education program for citizens of all ages covering how planning for growth is key to environmental quality.	City of Olympia, Washington: Environment Element	I	City-wide	Land Use Law Center, ND
			Ensure communication materials and methods are accessible, in different languages and use traditional social media to engage with the community.			City-wide	City of Norfolk, 2016; Cashman, 2011
			Invest in a highly visible public outreach campaign.			Coastal High Hazard Area	City of St. Petersburg, 2019; Interboro, 2014
		Overally Resiliency					
			Incentivize and fund the creation of affordable and resilient housing through a City-wide affordable housing strategy (equity).			City-wide	City of St. Petersburg, 2019; Interboro, 2014
			Identify and protect local environmentally dependent economies.			City-wide	Thornton & Scheer, 2012
			Establish a methodology to guarantee equity and fairness in any mitigation efforts.			City-wide	
	Reducing Greenhouse Gas Emissions and Carbon Footprint						

			Develop industry and transportation goals to reduce emissions. Monitor results for the elimination or calculated reduction of fossil fuel dependency.			City-wide	City of St Petersburg, 2019
			Identify environmental carbon storage areas.			City-wide	Sheehan et al., 2016
			Reduce vehicle miles traveled			City-wide	City of Norfolk 2016; The Field Operations Team, 2018
			Promote alternative energy sources.			City-wide	City of St Petersburg, 2019
			Improve energy efficient standards for public buildings.			City-wide	City of St Petersburg, 2019
			Establish a goal to transition the county (or public buildings) to 100% clean energy.			City-wide	City of St Petersburg, 2019
			Adopt a building energy benchmarking and disclosure policy.			City-wide	City of St Petersburg, 2019; New York City Buildings, 2020
			Require LEED or similar programs for government buildings.			City-wide	City of St Petersburg, 2019
			Provide fast-track permitting, refund of permit fees, impact fee reduction and density bonuses for working with resiliency goals.			City-wide	City of Norfolk, 2016; City of St Petersburg, 2019
			Coordinate transportation-related adaptation policies across jurisdictional boundaries and ensure consistency among broader planning and plan implementation efforts. Specifically, strategies for preparing for sea level rise.			City-wide	Broward County. 2015
	Transportation						
			Increase road surface elevation standards, subsurface stabilization, stormwater management and drainage, and adjustment of bridge heights to allow for navigation, should be collaboratively assessed and implemented.			Coastal Floodplain Overlay Zone	Broward County. 2015
	Environmental Element						
	Improving Hydrology						
			Fund or undertake stream restoration and expansion projects for tidally influenced waterbodies.		S	City-wide	Abrette, 2013
			Address potential impacts on the coastal aquifer from water quality changes and flooding of coastal and tidally influenced bodies of water that may occur due to more intense storms, higher surface water temperatures and rising sea levels.		I	City-wide	Broward County, 2015
	Conservation and Restoration						
			Include plans to facilitate tidal wetland migration in response to sea level rise.	New York has incorporated consideration of SLR in its Open Space Conservation	I	Coastal Floodplain Overlay Zone	Grannis, 2011
			Prioritize areas for conservation based on flood-buffering potential or other ecosystem services.		S	Waterfront Properties, City-wide	Abrette, 2013
			Protect and improve coastal habitats, including mangroves, marshes, oyster beds and sea grass	The Coastal Marshlands Protection Act	I	Estuary	Sheehan et al., 2016; Greenlaw, 2019
			Increase and facilitate conservation incentives.	In Chatham County, Georgia, developers are permitted to increase a project's density by 10% above regulations if 40% of the land is reserved for conservation.	I	City-wide	The Nature Conservancy and Southeast Florida Regional Compact for Climate Change, 2014; Sheehan et al., 2016
			Restore hydrologic eco-hydric function in the ecosystem, as feasible.		S	City-wide	FCCDR, 2020

			Protect and improve existing wetlands. a. Prohibit removal, alteration, or encroachment within wetlands except in cases where no other practical alternatives exist that will permit a reasonable use of the land or where there is an overriding public benefit b. Protect wetlands and watercourses from land development activities by requiring the establishment of natural area buffers adjacent to all post-developments and watercourses within a watershed overlay. Require Low Maintenance Zones (LMZ) to be established between developed areas and shorelines, contiguous to any waterbody, wetland or seawall, to reduce impacts of climate change and the negative effects of storm surge and tidal velocity, and the erosive effect of wave action. c. Establish coastal buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced or vulnerable water bodies. Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones where ecologically feasible. d. Utilize watershed management plans to protect landscape scale wetland conservation areas.	Escambia County, Florida: Coastal Conservation and Management Element; Collier County, Florida: Conservation and Coastal Management Element; Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Wetlands	Land Use Law Center, ND; FCCDR, 2020
			Eliminate invasive aquatic weeds and the protection of native plant communities; the development of integrated structural and non-structural shoreline protection measures; and development that does not change the composition of the beach and bottom substrate.	Pacific County, Washington: SMP Ocean Coast Requirements	I	Wetlands	Land Use Law Center, ND
			Prohibit alteration of natural shore functions as well as the protection and restoration of native vegetation.	Collier County, Florida: Conservation and Coastal Management Element	I	Wetlands	Land Use Law Center, ND
			Encourage the design and use of naturally regenerating systems, and discourage any proposed activity that may materially weaken or damage existing vegetation.	City of Corpus Christi, Texas: Dune Protection, Rolling Easements	I	Wetlands	Land Use Law Center, ND
			Create an environmental habitat protection committee.	The Coastal Marshlands Protection Act	I	x	Greenlaw, 2019
	Stormwater Element						
	Design						
			Design all water supply and sanitary sewage systems to minimize or eliminate floodwater infiltration or discharges into floodwaters.	Flood-Fringe Overlay District: Woodstock, New York		Coastal High Hazard Zone and the .4% Floodplain	Center for Coastal Resources Management, 2020
			Implement drainage improvement projects.			City-wide	Environmental Resources Management, 2011
	Economic Development Element						
	Leveraging the Private Sector						
			Leverage opportunities for private sector investment			x	City of St. Petersburg, 2019
	Mitigation for Business						
			Integrate natural hazard mitigation for businesses through the Economic Development Plan Element			x	FEMA, 2013

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SEA LEVEL RISE AND REGULATION

I Implemented

S Suggested

POLICY DOCUMENT	DESCRIPTION	RESOURCE DOCUMENT, PLACE OR POLICY			REFERENCE
TAMPA CODE OF ORDINANCES					
Chapter 5 Building Code					
Base Flood Elevation					
	Use the FEMA 500-year flood maps as base flood protection	Used by the Naval Academy	I		Environmental Resources Management, 2011; Grannis, 2011
Freeboard					
	Increase building height 1' from what is required by Florida Building Code in flood-prone areas, to 2 feet above BFE.	Recommendation from Florida International University; Somerset County Rising Sea Level Guidance. Maryland Jurisdictions; Maryland Working Group; Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions; Worcester County Sea Level Rise Guidance Document. Maryland Jurisdictions (I)	I	Coastal High Hazard Areas	Harris, 2019; Center for Coastal Resources Management, 2020; Environmental Resources Management, 2011; Grannis, 2011
	Provide incentives such as a rebate of $500 on building permit fees for inclusion of increased freeboard in the building design.	Sea Level Rise Zoning Overlay in Hull, Massachussetts	I	Coastal High Hazard Areas	Center for Coastal Resources Management, 2020
	Require freeboard to be three feet above the designated FEMA Base Flood Elevation.	Escambia County, Florida: Coastal Conservation and Management Element	I	Coastal High Hazard Areas	Land Use Law Center, ND
Building Height					
	Allow structures to exceed the existing 25 foot height limit by the number of feet needed to raise the house to BFE, plus a maximum credit of up to 4 feet above BFE. The maximum height for any structure is set at 40 feet (15 feet above current limit).	Flood Protection Building Height exception in the zoning regulations: Key West, Florida		Coastal High Hazard Areas	Environmental Resources Management, 2011; Center for Coastal Resources Management, 2020
	Allow height to be measured from the DFE, rather than from grade, to allow buildings to meet flood-resistant construction standards. In areas in which the BFE above grade equals or exceeds four feet, rules allow height restrictions to be measured from a reference plane located higher than the DFE – nine, 10 or 12 feet above grade depending on the building's use.		I	Coastal High Hazard Areas	New York City Planning, 2020
Design Criteria					
	Incorporate design criteria so that buildings will withstand a minimum service life of 50 years.	Florida Action Team	S	New or re-development, in Protection and Accommodation Zones.	Grannis, 2011
	Treat structures that are vulnerable to 100 centimeters of sea level rise over the next 100 years as non-conforming structures.	EPA	S	Existing buildings in an SLR Vulnerability Zone, such as Accomodation and relocation zones.	Grannis, 2011
Mechanical, Electrical, and Plumbing (MEP) Services					

				Allow MEP equipment to be in the building bulkhead, as a permitted obstruction on required rear yards and open space, or within the building. When placed outside of the building, design requirements would ensure that the equipment is screened from view. When placed within the building, floor area rules would also allow spaces used to access the MEP room and areas used for the storage of flood panels to be exempted from floor area calculations. Allow spaces used to access the MEP rooms and areas used for the storage of flood panels to be exempted from floor area calculations.		I	Multi-Family and Commercial Areas within the Coastal High Hazard Area	New York City Planning, 2020
				Modify minimum distance between building requirements to allow more flexibility for the construction of MEP buildings, facilitating new utility structures on larger campus-style housing sites.		I	Multi-Family and Commercial Areas within the Coastal High Hazard Area	New York City Planning, 2020
				Introduce flexibility to power systems, such as emergency generators, allowing them to encroach on side and rear yards and open space on a citywide basis for all building types		I	Coastal High Hazard Area	New York City Planning, 2020
				Allow up to 500 square feet of floor area to be added to existing heavy commercial and manufacturing buildings.		I	Multi-Family and Commercial Areas within the Coastal High Hazard Area	New York City Planning, 2020
				Require proposed central package systems to be designed and installed to recognize anticipated flooding and groundwater conditions.	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions	I	Coastal High Hazard Area	Environmental Resources Management, 2011
			Electric Systems					
				Require 2 feet above the FEMA base flood elevation for electrical equipment.	Maryland	I	Coastal High Hazard Areas	Environmental Resources Management, 2011
				Require electrical distribution panels to be at least 3 feet above the BFE.		S	Coastal High Hazard Areas	Environmental Resources Management, 2011
			Plumbing					
				Require 2 feet above the FEMA base flood elevation for plumbing equipment.	Maryland	I	Coastal High Hazard Areas	Environmental Resources Management, 2011
		Septic Tanks						
				Review groundwater maps before allowing septic tanks to be installed	Recommendation from Florida International University	S	Coastal High Hazard Areas	Harris, 2019
				Prohibit cesspools, septic tanks, or other sewage devices, or any fuel storage device within 200 feet of a freshwater or tidal wetland or beach.	East Hampton, New York	I		Center for Coastal Resources Management, 2020
				Designate areas where septic tanks and hazardous materials must be removed to prevent pollution of coastal waterbodies. A progression of this district based on sea level rise rates in conjunction with a grace period could be used to give property owners advance notice of the requirement.	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions; Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Coastal High Hazard Areas	Environmental Resources Management, 2011
				Require removal of old tanks as a condition of property transfer or utility hook up.	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions		Coastal High Hazard Areas	Environmental Resources Management, 2011
		Hazardous Materials						
				Require storage of hazardous materials to be at least 3 feet above the BFE.	Recommendation from Florida International University	S	Coastal High Hazard Areas	Environmental Resources Management, 2011
		Plans and Specification Requirements						
				Require subdivision sketch, preliminary and final plats to show the "Floodplain Planning Zone."	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions		Coastal High Hazard Areas, or the Floodplain Planning Zone	Environmental Resources Management, 2011
				Design buildings to have only a 0.5 percent chance of flooding in any year for the life of the structure.	Florida Action Team	S	Coastal High Hazard Areas	Grannis, 2011

				All Environmental Impact Statements (EIS) must offer in-depth analysis of how the proposals will impact or be impacted by SLR; all favorable and adverse environmental impacts of the proposed use; a statement of the expected flood hazard present on the site; the means and costs necessary to minimize the adverse impacts; and identification of any irreversible commitment or alteration of natural features as a result of the proposed action.	South Kensington, Rhode Island: High Hazard Overlay; Maine Sand Dune Rules; California Adaptation Strategy	I	Coastal High Hazard Areas	Hawai'i Climate Change Mitigation and Adaptation Commission, 2017; Land Use Law Center, ND; Grannis, 2011
		Variances						
			General					
				Allow buildings to increase the degree of non-compliance due to resiliency work. As an example, a non-conforming attached home with non-compliant yards located within a residence district that only allows detached structures, would be able to relocate floor space currently located below the DFE to the top of the structure, even if the enlargement work increases the degree of non-compliance with yard regulations. Another example would be a non-conforming residence in a manufacturing district, which would be able to be elevated or retrofitted to or above the DFE, or be reconstructed, if located within areas that are predominantly residential.		I	Coastal High Hazard Areas	New York City Planning, 2020
				Expand applicability of optional rules, so that property owners can build toward future conditions.		I	Coastal High Hazard Areas	New York City Planning, 2020
				Allow areas used for internal ramps and stairs to be exempted from floor area calculations.		I	Coastal High Hazard Areas	New York City Planning, 2020
				Modify use regulations for mixed-use buildings to provide more flexibility for the placement of commercial uses, such as storage space for businesses, to floors above the DFE even when not allowed through typical zoning standards.		I	Coastal High Hazard Areas	New York City Planning, 2020
			Narrow Lots					
				Allow buildings on narrow lots to encroach into side lot buffer space		I	Coastal High Hazard Areas	New York City Planning, 2020
			Historic Structures					
				Require floodproofing to the extent feasible while preserving the historic building exterior. Materials that can survive flooding should be used for interior renovations; when windows or doors are replaced, use floodproofing installation to the extent consistent with historic preservation goals.			Coastal High Hazard Areas	Environmental Resources Management, 2011
		Floodproofing (Commercial Buildings)						
				Through floor area exemptions, encourage new and existing commercial buildings to floodproof the ground floor while providing building access at grade, and design storefronts that are located at grade and are visually accessible at the sidewalk level. If building owners opt to elevate the ground floor instead of utilizing these incentives, the proposal would require buildings to provide streetscape strategies that soften the impact of elevated uses on the public realm.		I	Commercial areas within the Coastal High Hazard Area	New York City Planning, 2020
				Allow a small floor-area incentive for active uses to be kept at grade and dry-floodproofed to encourage retail continuity at street level. To ensure quality ground floors, this flood-area exemption would come with design controls, such as transparency requirements that meet dry-floodproofing regulations, and the condition that the ground floor be at least 13-feet high.		I	Commercial areas within the Coastal High Hazard Area	New York City Planning, 2020
		Design Standards						
				Provide exterior circulation for raised buildings			Coastal High Hazard Areas	City of Boston, 2019; New York City Planning, 2020

				Single and two-family homes that elevate their first occupiable floor at or above five feet must either raise and plant the front yard, design a porch in front of the building, or design a stair turn and install planters to help alleviate blank walls.				New York City Planning, 2020
		Sea Walls						
				Condition approval of coastal development permits on a landowner's agreement not to build hard armoring. Landowners must show that soft armoring is not feasible before they will be issued a permit for hard a protective structure.	California Coastal Commission; Implementation of Conditional Development and Exactions in a SLR Context; Maryland Living Shoreline Protection Act; Maine, North Carolina, Rhode Island, and Texas	S	Waterfront Property	Grannis, 2011
				Require landowners to mitigate the impacts of permitted hard armoring. For example, landowners could be required to pay impact fees to mitigate damages to natural resources.	Implementation of Hard-Armoring Permits in a SLR Context	S	Waterfront Property	Grannis, 2011
				Develop criteria to require the removal of armoring under certain circumstances, such as when armoring is damaged by storms (consider a 50% rule or similar, or an overlay in the PDRP) or when it comes to encroach on public lands as the foreshore erodes.	Implementation of Hard-Armoring Permits in a SLR Context; South Carolina	I	Waterfront Property	Grannis, 2011
				Where permitted, shoreline protection projects shall withstand a 100-year flood event taking into account projected sea level rise for the life of the structure.	California San Francisco Bay Conservation and Development Commission; Main Sand Dune Rules	I	Waterfront Property	Grannis, 2011
				Structures must be at least 5 feet above NAVD88	Broward County	I	Waterfront Property	Broward County, 2021
				Reduce storm damage by requiring that the top of bulkheads and piers generally have a minimum elevation of 8.3 feet. Allow flexibility where this elevation is not feasible given the elevation of the specific property.		S		Environmental Resources Management, 2011
				Seawalls must be in good repair or property owners will receive fines.	Broward County	I	Waterfront Property	Broward County, 2021
				Remove structures that come to be located on an intertidal zone (seaward of the mean high tide line) for a period of six consecutive months.	Maine Sand Dune Rules	I	Waterfront Property	Grannis, 2011
		Chapter 16 Parks and Recreation						
		Landscape Area Trust Fund		Take advantage of the Landscape Area Trust Fund to establish functional park space, to create a flexible coastline and mitigate the effects of sea-level rise.			Waterfront Property	From existing policy in the City of Tampa code, Section 16-101
		Chapter 19 Property Maintenance and Structural Standards						
		N/A						
		Chapter 21 Stormwater Management						
		N/A						
		Chapter 22 Streets and Sidewalks						
		N/A						
		Chapter 25 Transportation						
		N/A						

	Chapter 26 Utilities						
	N/A						
	Chapter 27 Land Development Code (Zoning and Development, overlays)						
	Floodplain Regulations						
		Delineations					
			Assume the 1% flood elevation to be equivalent to the Category Two storm surge elevation, until federal agencies can update their maps, which will vary depending on the waterway.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions	I	1% Floodplain	Environmental Resources Management, 2011
		Rules					
			Require subdivision standards when a parcel contains more than one acre of wetlands, 20% or more of the parcel is wetlands or within the Shoreline Zone, or a subdivision will alter 4,300 square feet or more of wetland if designed and developed in conventional layout.	Scarborough, Maine	I	Wetland Areas	Center for Coastal Resources Management, 2020
			Protect flood storage capacity – using land development criteria and low density zoning to reduce the damage potential within the floodplain and help maintain flood storage and conveyance capacity. Set strict limits on the amount of impervious surfaces.	The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011; Nags Head, North Carolina: managed retreat at work	I	City-wide	Environmental Resources Management, 2011; Neal, 2019
			Create specific development prohibition in floodplain areas. Examples include the prohibition of new sheds in the floodplain and prohibiting the expansion of the footprint of existing homes.	The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011	I	Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
			Set development densities or water-dependent use requirements to assist in coastal growth management and/or gradually move development out of high flood-risk areas.		S	Coastal High Hazard Area or Flood Resiliency Zone	Abrette, 2013
			Limit the development of oceanfront hotels and condominiums.	Nags Head, North Carolina: managed retreat at work	I	Waterfront Properties	Neal, 2019
			Adopt policies requiring the removal of existng structures and the restoration of the site to its natural condition if waters rise to touch the structure for a specified amount (six) of consecutive months.	EPA	S	Waterfront Properties	Grannis, 2011; Ankersen et al., 2010
	Buffer Zones and Setbacks						Grannis, 2011
			Specify the upland or landward portion of the lot to be developed while the low-lying portion is reserved for soft or natural flood protection.		S	Waterfront Properties	Abrette, 2013
			Require a 25-foot minimum vegetated buffer.. For all new non-beachfront shoreline development in the.. Coastal zones.	South Carolina Shorelline Change Advisory Committee	S	Waterfront Properties	Grannis, 2011
			Require a 30-foot buffer for development along estuarine shorelines.	North Carolina	I	Waterfront Properties	Grannis, 2011
			Establish an erosion-based minimum setback for shoreline development based upon the (annual coastal erosion rate) x (a planning period representing the economic lifetime of the coastal structure) + (an additional buffer). Also utilize to set back structures from eroding shorelines to allow for beach preservation.	North Carolina; The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011	I	Waterfront Properties	Grannis, 2011; Ankersen et al., 2010; Environmental Resources Management, 2011
			Require structures to be set back 50 times the annual erosion rate plus 20 feet or adhere to previous setback requirements (25 feet for 100 foot lots)	Maui, Hawaii	I	Waterfront Properties, lot depths of 100 feet or less	Grannis, 2011
			Require structures to be set back 50 times the annual erosion rate plus 20 feet or adhere to previous setback requirements (40 feet for lots larger than 100 feet).	Maui, Hawaii	I	Waterfront Properties, lot depths of more than 100 feet	
			Require a setback of 40 feet or greater + (70 times annual coastal erosion rate) + 20 feet for lot depths less than 140 feet	Variable Setback Requirements Based on Erosion: Kauai, Hawaii	I	Waterfront Properties, lot depths less than 140 feet	Center for Coastal Resources Management, 2020

				Require a setback of (average lot depth)/2+40 feet, for lot depths of 140 feet to 200 feet -	Variable Setback Requirements Based on Erosion: Kauai, Hawaii	I	Waterfront Properties, lot depths between 140 and 200 feet	Center for Coastal Resources Management, 2021
				Require a setback of 100 feet from shoreline for lot depths greater than 200 feet.	Variable Setback Requirements Based on Erosion: Kauai, Hawaii	I	Waterfront Properties, lot depths greater than 200 feet	Center for Coastal Resources Management, 2022
				Require a setback line greater than 60 feet for all other lots.	Variable Setback Requirements Based on Erosion: Kauai, Hawaii	I	Waterfront Properties, lot depths greater than 200 feet	Center for Coastal Resources Management, 2020
				Require that development adjacent to the Bay include a 100-foot buffer measured inland from the edge of wetlands, shores, or streams.	Chesapeake Bay Preservation Act (CBPA); Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Waterfront Properties	Grannis, 2011; Land Use Law Center, ND
				Allow a tiered setback based upon the size and type of structure.	North Carolina	I	Waterfront Properties	Grannis, 2011
				Require structures greater than 2,500 square feet be set back a distance calculated based upon the future shoreline position considering two feet of SLR over the next 100 years.	Maine Sand Dune Rules	I	Waterfront Properties	Grannis, 2011
				Setback smaller structures (less than 5,000 square feet) 30 times the erosion rate; larger structures must be set back 60 to 90 times the erosion rate based upon the size of the structure.	North Carolina	I	Waterfront Properties	Grannis, 2011
				Allow for a variance if, after imposition of the setback, the lot does not have 30 feet of buildable space.	Maui, Hawaii	I	Waterfront Properties	Grannis, 2011
				Prohibit new erosion control structures or buildings larger than 5,000 square feet seaward of a setback line. The line must 40 times the average annual erosion rate or not less than 20 feet from the crest of the first seaward san dune, whichever is greater.	South Carolina Beach Front Management Act	I	New or re-development, in Areas of Accomodation	Grannis, 2011
				Regulate land use activities within 250 feet of all tidal waters, great ponds, rivers, coastal wetlands, and non-forested freshwater wetlands of 10 acres of more, and within 75 feet of streams.	Maine: Mandatory Shoreland Zoning Act	I	Waterfront Properties	Land Use Law Center, ND
				Reduce side yard requirements if the lot is narrower than 30 feet (to a minimum of three feet); (b) reduce rear yard requirements if the lot is shallower than 95 feet (to a minimum of 10 feet); and (c) meet front yards and setbacks of neighboring buildings, to best align to surrounding neighborhood context. In exchange for this flexibility, the building would be limited to a maximum height of 25 feet, as measured from the reference plane, instead of 35 feet (most common maximum height in low-density districts).	New York City	I	New or re-development, in Areas of Protection and/or Accomodation	New York City Planning, 2020
		Conditional Development and Exactions (Permitting)						
				To acquire a permit, roads and sewer lines shall be elevated and evaluated to be more resilient to flood impacts.	Implementation of Conditional Development and Exactions in a SLR Context	S	New or re-development, in Areas of Protection and/or Accomodation	Grannis, 2011
				Prohibit projects if, within 100 years, the property may reasonably be expected to be eroded as a result of changes in the shoreline such that the project is likely to be severely damaged after allowing for a [two-]foot rise in sea level over 100 years.	Maine Sand Dune Rules	I	Areas of Accomodation or Relocation	Grannis, 2011
				Prohibit new construction of wood frame, multi-story, multi-family buildings.	Nags Head, North Carolina: managed retreat at work	I	Coastal High Hazard Area or Flood Resiliency Zone	Neal, 2019
		Impact Fees						
				Require the developer to pay a fee to cover the costs of future armoring, to mitigate impacts to natural resources from future armoring, or to flood-proof infrastructure that services the new development.	Implementation of Conditional Development and Exactions in a SLR Context	S	Waterfront Property	Grannis, 2011

				Implement an additional 2% tax on houses over a certain price, or within a certain area, and utilize this extra influx of tax money to increase spending on wetland conservation and sea level rise mitigation including additional bulkheads that are free of negative wetland impact.	Town of East Hampton, NY: Coastal Management Element	I	Coastal High Hazard Area or Flood Resiliency Zone	Land Use Law Center, ND
		Incentives						
				Provide incentives to encourage localities to increase regulations in floodplain above the minimum requirements of the NFIP.	FEMA Community Rating System	I	Coastal High Hazard Area or Flood Resiliency Zone	Grannis, 2011
				Improve compliance with the City's Floodplain Ordinance, by enacting a strict penalty for violations.	Scarborough, Maine		Coastal High Hazard Area or Flood Resiliency Zone	Center for Coastal Resources Management, 2020
				Amend conservation tax credit program to make the donation of unbuildable or threatened lots a more appealing option to homeowners.	North Carolina Steering Committee	S	Areas of Accomodation or Relocation	Grannis, 2011
				Provide a one-time tax credit to landowners who voluntarily agree to preserve their property for conservation purposes.	North Carolina Conservation Tax Credit Program	I	Areas of Accomodation or Relocation	Grannis, 2011
				Offer preferential assessments to landowners who agree to conserve their property for flood control or open space purposes. Landowners who donate easements would be assessed lesser property taxes based upon the loss of value caused by the easement terms limiting uses of the property.		S	Areas of Accomodation, Relocation, or Conservation	Grannis, 2011
				Deduct up to 40 percent of the value of the easement from state income tax, for landowners who donate conservation easements. (not applicable in Florida)	Virginia	I	Areas of Accomodation, Relocation, or Conservation	Grannis, 2011
				Provide a one-time tax credit to property owners who move structures out of at-risk areas (either relocating on the same or a different parcel) or retrofit structures to be more resilient to flooding and surpass the minimum standards required by existing ordinances (i.e., the minimum required setbacks or building elevations). Encourage the landward siting and relocation of structures and public facilities in areas adjacent to receding shorelines through tax incentives.	Florida Action Team	S	Areas of Accomodation or Relocation	Grannis, 2011
				Provide tax incentives or density bonuses to encourage developers to site new development in lower-risk areas of a lot or a subdivision.		S	City-wide	Grannis, 2011
				Offer a Green Building Tax Credit to property owners who make "green" improvements to their buildings.	New York. The Green Building Tax Credit may be a useful model for creating a tax credit program to encourage landowners to retrofit structures to be more resilient to flood impacts.	I	City-wide, and in the Coastal High Hazard Area or Flood Resiliency Zone	Grannis, 2011
				Streamline the building permit process for any resident who will voluntarily agree not to build any structures within 150 feet of a wetland and to not disturb its upper edge. This creates an incentive for residents ready to build.	Town of East Hampton, NY: Natural Resource Protection Ordinance	I	Near Wetlands	Land Use Law Center, ND
		Transferable Development Credits						
				Establish and calibrate a development credit market in a manner that gives affected landowners an incentive to transfer their development rights rather than build on threatened properties.	Implementation of Transferable Development Credits in a SLR Context	S	Areas of Accomodation and Relocation	Grannis, 2011
				Require developers to acquire and extinguish a TDC from a substandard lot before they can get approval for a new subdivision.	Malibu, California, provides a useful example of a coastal area that has successfully implemented a TDC program.	I	Areas of Accomodation and Relocation	Grannis, 2011

				Utilize a development credit bank to facilitate transfer of credits and ensure a floor price for credits.	New Jersey Pinelands program. Although more difficult to design and administer, regional TDC programs have the benefit of conserving more acreage while creating a larger market for development credits.	I	Areas of Accomodation and Relocation	Grannis, 2011
				Provide bonuses in receiving areas for suburban communities that can support more intense or dense uses in specific areas.	Massachusetts developed a Transfer of Development Rights Model Bylaw. The bylaw provides examples of two different approaches to creating a TDR program.	I	Areas of Accomodation and Relocation	Grannis, 2011
		Rolling Easements						
				Propose the use of rolling easements as a wetlands protection policy in order to maintain water quality and sediment transport. Add shoreline protection prohibitions, limitations, specific covenant in conservation easements or rolling easement requirements through subdivision standards to ensure that coastlines can continue to migrate inland as the seas rise and limit the impact of sea level rise. Allow beach nourishment and some small projects. Allow for repairs in certain circumstances and only if the structure remains above the mean high-tide line.	A voluntary, parcel-specific rolling conservation easement obliges a property owner to forgo any rights to protect upland structures such that the fee simple property shall "forever yield to the sea." The easement may also require removal of the structure. Such an easement may provide significant tax advantages to the property owner.	S	Areas of Accomodation and Relocation	Grannis, 2011; Ankersen et al., 2010; Center for Coastal Resources Management, 2020
		Subdivision Regulations and Cluster Development						
				Prohibit expansion or intensification of current uses, but allow ordinary maintenance and repair if damage to structures does not exceed 50 percent.	EPA	S	Areas of Accomodation	Grannis, 2011
				Require a significant portion of the subdivision be set aside for open space (e.g., at least 50% for a subdivision with sewer lines), and include wetland buffers, among other requirements.	Scarborough, Maine		Areas of Accomodation	Center for Coastal Resources Management, 2020
				Enact a Subdivision Ordinance that allows developers to increase the density of a development project by 10 percent if 40 percent of the acreage is set aside for conservation space.	Chatham County, Georgia	I	Areas of Accomodation	Grannis, 2011
				Encourage subdivisions that promote high density development that maximizes efficient use of transportation and other public services, and the conservation of natural resources, habitat and open space.	Minnesota Planning Environmental Quality Board and American Planning Association: Conservation Subdivision Ordinances	I	Areas of Accomodation	Grannis, 2011
				Allow (or require) adjoining lots in common ownership to be combined into a single lot, prior to rebuilding after a storm.	Nags Head, North Carolina: managed retreat at work	I	Areas of Accomodation	Neal, 2019
				Allow homeowners to relocate houses threatened by erosion to another location on their own property. Allows developers to subdivide if using deep lots that allow for coastal migration to occur.			Areas of Accomodation	Neal, 2019
				Allow (or require) adjoining lots in common ownership to be combined into a single lot, prior to rebuilding after a storm.	Nags Head, North Carolina: managed retreat at work	I	Areas of Accomodation	Neal, 2019
		Overlay Zones						
			1% Floodplain					
				Revise zoning ordinance to prohibit residential development in the 1% floodplain.	Chatham County, Massachussetts	I	1% Floodplain	Grannis, 2011
			Flood Resiliency Zone (that Supercedes All District or Overlay Zoning)					
				Require an overlay zoning district requiring sea level rise-related and flood proofing requirements (for areas such as wetlands, beaches, and floodplains).	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions; Portsmouth Virginia Floodplain Management Plan and Repetitive Loss Plan. 2010		x	Environmental Resources Management, 2011; Grannis, 2011

				Expand flood provisions in a regulatory overlay that supercedes district overlays, to include the .02% flood zone in addition to the 1% flood zone. This allows property owners the opportunity to make incremental updates for future conditions.			x	New York City Planning, 2020
				Allow the application of flood resistant zoning where any portion of the lot is touching the FIRM map designation 1% or the .02% annual chance floodplain instead of where touching the building (the current FEMA standard)			x	New York City, 2020
				Create stricter flood regulations for critical facilities (hospitals, fire stations, hazardous materials storage sites, etc.).	The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011		Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
				Redefine riverine flood hazard zones to match projected expansion of flooding frequency and extent.	EPA	S	x	Grannis, 2011
				Limit the intensity of permitted development to allow only limited residential, recreational, agricultural and commercial fishing uses within the 100-year floodplain.	Chatham County, Massachussetts	I	Coastal High Hazard Area or Flood Resiliency Zone	Grannis, 2011
				Regulate the areas projected to be within the 100 year flood plain as a "Floodplain Planning Zone".	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions	S	Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
				Designate Adaptation Action Areas (state level law from 2011, the Community Planning Act)	'The designation prioritizes funding for infrastructure and adaptation planning. Local governments that adopt an adaptation action area may consider management policies to improve flooding resilience from hazards such as storm surge, flash floods, and sea-level rise, among others (F.S.A. §§ 163.3164 and 163.3177(5)(g)).'		Coastal High Hazard Area or Flood Resiliency Zone	Miller et al., 2020; Southeast Florida Regional Climate Compact, 2019; Donaldson, 2019
				Create a coastal erosion overly district that prohibits the construction of new hard coastal armoring in certain areas. The ordinance requires projects within the district to be designed to control or prevent flooding and erosion using natural features of the coastline. In certain areas, erosion control structures can be built, but they require a special natural resources permit.	East Hampton, New York Zoning Ordinance 2007; Cedar Key	I	Waterfront Property	Grannis, 2011; Barry et al., 2021
				Located by the year 2100 high sea-level rise scenario plus the 1% flood event (in rainwater inches)	San Franscisco Sea-level Rise Action Plan	I	x	San Francisco Planning, 2021
			Erosion Hazard Area					
				Allow moveable structures in structural hazard areas, but the structure must be moved before the shore edge reaches 10 feet from the structure's waterward edge.	New York's State Policy: Coastal Erosion Hazards Areas Program	I	Waterfront Property	Land Use Law Center, ND
				Require Coastal Erosion Management Permits for construction and other activities that occur within a designated erosion hazard area.	New York's State Policy: Coastal Erosion Hazards Areas Program	I	Waterfront Property	Land Use Law Center, ND
			Ankersen Model					
				Establish a 'Vulnerable Area" temporal and spatial sea-level rise overlay district	This has been accomplished by the Rockingham Planning Commission, in New Hampshire	I	x	Ankersen et al., 2010
				A Protection Zone within the Vulnerable Area. Through soft and hard shoreline stabilization that seeks to maintain a static shoreline position within the City/County.		S	x	Ankersen et al., 2010
				An Accomodation Zone within the Vulnerable Area where all aspects of the built environment can withstand additional permanent or periodic inundation based on sea level rise projections through structural and non-structural solutions. The City/County shall develop priority areas for land acquisition based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration.	The Town of Marineland requires new development to provide 50% additional stormwater storage capacity than currently required by law.		x	Ankersen et al., 2010

				A Managed Relocation Zone within the Vulnerable Area. In this area the goal is to reduce the density and intensity of future land use along unprotected shorelines. The City/County shall eliminate new investment in public infrastructure likely to be subject to the impacts of sea level rise within the planning horizon. Also, reduce residential land use densities targeting a specific amount of units or commercial square feet per acre. The City/County shall prohibit hard shoreline stabilization techniques (Sarasota is provided as a reference). Develop programs to encourage abandonment of undeveloped properties and relocation of existing structures.			x	Ankersen et al., 2010
			Abrette Model					
				Create a Conservation Zone. This includes areas that either provide the greatest natural protection or have non-critical structures at the greatest risk of extensive damage. The purpose is to gradually move development out of these areas and replace it with natural protection, marsh advancement areas, open space, or public access. This can be achieved by downzoning to low density, water-dependent purposes.	Example: Town of Sullivan's Island, South Carolina: Beach Preservation; Recreation and Conservation Area Districts	I	x	Abrette, 2013; Land Use Law Center, ND
				Prohibit the construction of residential dwelling units in Conservation Zone and no building may be constructed in FEMA-designated V and V1-30 Zones.	Chatham, Massachusetts: Conservancy Districts Overlay	I	Areas of Relocation	Land Use Law Center, ND
				Subject pre-existing structures and uses to the zoning ordinance's non-conforming use provisions.	Chatham, Massachusetts: Conservancy Districts Overlay	I	Areas of Accomodation or Relocation	Land Use Law Center, ND
				Re-delineate the landward boundary of Conservation Zone to coincide with the 2050 inundation area and reduce the allowed density.	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions	I	Areas of Relocation	Environmental Resources Management, 2011
				Create a Protection Zone. This would include areas with critical infrastructure and dense development that have few options for adaptation. These areas, which may include town centers and historic districts, likely rely on existing hard armoring for flood protection and erosion control. Maintenance of existing hardened flood protection structures may be permitted while other resiliency practices are encouraged, such as employing green infrastructure for stormwater control.		S	x	Abrette, 2013
				Create an Accomodation Zone. For moderately to intensely developed but non-critical areas, promotes development that considers future SLR. Downzoning to lower impact uses reduces risk exposure. Building codes are strengthened with setback, elevation, freeboard, and construction requirements; as well as limits on structure height and footprint size. Shoreline armoring is restricted to soft or natural solutions.		S	x	Abrette, 2013
			Grannis Model					
				Create a Retreat Zone.	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions	S	x	Grannis, 2011; Environmental Resources Management, 2011
				Create a Preservation Zone		S	x	Grannis, 2011
			Chesapeake Bay Model					
				Identify intensely developed areas - Developed areas with little habitat that are the preferred location for new development,	The Chesapeake Bay Critical Area	I	x	Grannis, 2011
				Limited development areas - Lightly developed areas where any new development must protect habitat	The Chesapeake Bay Critical Area	I	x	Grannis, 2011

				Resources conservation areas- Predominantly wetlands where only limited residential development is permitted.	The Chesapeake Bay Critical Area	I	x	Grannis, 2011
			Coastal Floodplain Overlay Zone					Environmental Resources Management, 2011
				Add a "Coastal Floodplain Overlay Zone" on zoning maps, covering an area that includes the City's current base floodplain and areas projected to be within the base floodplain by 2050, on the coast only.			x	
				Apply "VE" area coastal floodproofing standards, as provided in FEMA regulations, within the Coastal Floodplain Overlay Zone. State that for lots within both the overlay zone and the floodplain district, the more stringent requirements apply.			x	Environmental Resources Management, 2011
			Coastal Construction Overlay Zone					
				Zone 1 - The active beach zone from existing mean high water line to the coastal construction control line as adopted by the Governor and Cabinet on December 19, 1978, and as filed with the Clerk of the Circuit Court, Pinellas County, Florida. New seawalls, or substantial improvements to seawalls, seaward of the coastal construction control line shall require permits from DEP and local government authorities. Normal and routine maintenance or repair of existing seawalls in their present location and original configuration will require no DEP permit; however, where such maintenance or repair is the result of erosion or, storm damage, a permit shall be required from the DEP and the municipality or county.	Section 3109 Pinellas Gulf Beaches Coastal Construction Code, 3106.5.2; 3109.6.1.2		xx	
				Zone 2 - This zone extends landward for 300 feet from the coastal construction control line established on December 19, 1978, and filed with the Clerk of the Circuit Court, Pinellas County, Florida, or to where the seaward right-of-way line of a State or County road occurs closer to the coastal construction control line than 300 ft, as indicated on Attachment A. All seawalls in Zones 2 must be in alignment with the existing adjoining seawalls, or seawall line, unless specifically authorized by the municipality or county. No construction shall be permitted within 18 feet of existing or new seawalls or the seawall line, unless designed by a design professional, in order to allow adequate tiebacks, tieback maintenance, and filter systems. All new seawalls shall have filter systems.	Section 3109 Pinellas Gulf Beaches Coastal Construction Code, 3106.5.3; 3109.6.2.2.1; 3109.6.2.2.2		xx	
				Excavation for swimming pools in Zone 2 may be permitted to an elevation of 6 feet or less below existing grade structure, provided that the pool excavation is located no closer than 18 feet to any seawall line unless designed by a design professional so that the location of the pool will not effect the integrity of the seawall or tieback system.	3109.6.2.3.3		xx	
				The pool shall be located and designed so that its failure resulting from a storm does not adversely affect the seawall or any adjoining major structure.	3109.6.2.3.4		xx	
				Zone 3 - All lands lying landward of Zone 2 within the Coastal Building Zone. All seawalls in Zone 3 must be in alignment with the existing adjoining seawalls, or seawall line, unless specifically authorized by the municipality or county. No construction shall be permitted within 18 feet of existing or new seawalls, or the seawall line, unless designed by a design professional, in order to allow adequate tiebacks and tieback maintenance and filter systems. All new seawalls shall have filter systems.	Section 3109 Pinellas Gulf Beaches Coastal Construction Code, 3106.5.4; 3109.6.3.1		xx	

			Resource Conservation Overlay Zone					
				Designate resource conservation areas primarily for agriculture, forestry, fisheries, and habitat protection.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Locate development at least 300 feet landward of tidal wetlands or waters.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Require habitat protection plans for the 100 foot buffer; for plant and animal habitat areas including nontidal wetlands; for threatened and endangered species; and for anadromous fish populations.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Prohibit channelization to protect fish populations and other resources.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Provide standards for each land classification, these include provisions for a wildlife corridor system in limited development areas, and impervious surface limits for both existing and new lots.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Expand buffer requirements from 100 to 200 feet for new subdivisions in resource conservation areas and for projects requiring site plan approval and involving a change in land use.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Require a 200 foot setback of new intensely developed areas and resource conservation areas from mean high water.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
				Require revisions that are nonstructural shoreline stabilization except where it can be proved to the Department of Natural Resources that soft stabilization is not feasible.	Worcester County, Maryland: Atlantic Bays Critical Area Ordinance	I	Areas of Relocation and Accomodation	Land Use Law Center, ND
			Rules					
				Permit taller buildings if the lowest floor is used as a "market hall", open community space, or parking.	Sea Level Rise Zoning Overlay in Hull, Massachussetts		Areas of Accomodation	Center for Coastal Resources Management, 2020
				Allow up to 6 feet of freeboard.	Sea Level Rise Zoning Overlay in Hull, Massachussetts		Areas of Accomodation	Center for Coastal Resources Management, 2020
				Require additional erosion controls or conservation easements within the district.	The Town of Stonington, CT has implemented a Coastal Area Management Overlay District, a Flood Hazard Overlay District, and a Groundwater Protection Overlay District. The Coastal Area Management Distrcit encompasses the 100-year coastal floodplain and all areas within 1000 feet of the mean high water mark and coastal wetlands.		Coastal Floodplain Overlay Zone	Abrette, 2013
				Prohibit new subdivisions.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Relocation and Accomodation	Environmental Resources Management, 2011
				Prohibit expansion of footprints on existing developed lots. Restrict major renovations of structures to cosmetic repairs, re-roofing, and replacement of appliances.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Accomodation	Environmental Resources Management, 2011
				Prohibit use of bermed infiltration ponds for development on unimproved lots.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Accomodation	Environmental Resources Management, 2011
				Require well heads to be raised above the base food elevation plus a height to accommodate wave action on storm surge.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Protection and Accomodation	Environmental Resources Management, 2011
				Provide for the closure of inundated roads where an alternate route exists.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Relocation and Accomodation	Environmental Resources Management, 2011
				Provide for the termination of maintenance for roads that serve only a few occupied residences.	Sea Level Rise: Technical Guidance for Dorchester County. Maryland Jurisdictions		Areas of Relocation and Accomodation	Environmental Resources Management, 2011
		Real Estate and Property Disclosures						
				Require sellers to disclose to potential buyers that a property is located in an area vulnerable to sea level rise.	Implementation of Real Estate Disclosures in a SLR Context	S	Coastal Floodplain Overlay Zone	Grannis, 2011

				Disclose if the property is located in a special flood hazard area as designated by flood insurance rate maps, or if the property may flood in the event of a dam failure, designated by the state Office of Emergency Services.	California	I	All identified flood vulnerability or future sea-level rise areas	Grannis, 2011
				Require landowners to disclose any regulations that restrict development of the parcel (such as setbacks and removal requirements).	Implementation of Real Estate Disclosures in a SLR Context	S	All identified flood vulnerability or future sea-level rise areas	Grannis, 2011
				A full disclosure law that alerts buyers of coastal property about erosion rates, storm history, sea level rise concerns, setback restrictions and other relevant information.	Florida Action Team; South Carolina Beachfront Management Act	S	All identified flood vulnerability or future sea-level rise areas	Grannis, 2011
				Ensure that buyers receive proper warning if the property under consideration is subject to special regulations concerning beach erosion, and if the property currently or previously used erosion control methods to address chronic erosion or storm-related damage.	South Carolina Shoreline Change Advisory Committee	S	All identified flood vulnerability or future sea-level rise areas	Grannis, 2011
				Require coastal property owners to provide coastal hazard assessments to all potential buyers.	North Carolina	I	Waterfront Properties	Grannis, 2011
	THE CITY OF TAMPA STORMWATER TECHNICAL STANDARDS MANUAL FOR PRIVATE DEVELOPMENT							
		Vulnerability Assessments						
				Encourage private owners of infrastructure to conduct a climate change vulnerability assessment.	Virginia Governor's Commission	S	City-wide	Grannis, 2011
				Require stormwater drainage facilities and systems to be designed to the established level of service standard in order to provide protection from flooding		I	City-wide	Pinellas County, 2017
	STORMWATER TECHNICAL STANDARDS MANUAL FOR PUBLIC DEVELOPMENT							
		Public Flood Protection Projects						
				Require stormwater drainage facilities and systems to be designed to the established level of service standard in order to provide protection from flooding		I	City-wide	Pinellas County, 2017
				Construct barriers to coastal floodwaters such as temporary flood walls, temporary dams, and improvements to the drainage system such as installation of backflow preventers on the city storm drain outflows into the bay.	Whitney Bailey Cox & Magnani, LLC (WBCM) Studies	S	Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
		Pumping Stations						
				Improve floodwalls around pump stations, flap or duckbill valves for storm drain outfalls and permanent or temporary pumps to discharge storm drainage systems over floodwalls.	Whitney Bailey Cox & Magnani, LLC (WBCM) Studies	S	City-wide	Environmental Resources Management, 2011
				Raise the elevation of low-lying utility equipment (such as pumping station)		S	Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
		Backflow Preventers						
				Require that for storm drains within the current or projected 100-year floodplain, backflow preventers be installed.		S	1% Floodplain	Environmental Resources Management, 2011
	THE CITY OF TAMPA TRANSPORTATION TECHNICAL MANUAL							
			Roads					
				Integrate climate adaptation and habitat migration into standards for designing transportation infrastructure. Do not build roads within areas of projected sea-level rise.		I	Coastal Floodplain Overlay Zone	Southeast Florida Regional Climate Compact, 2019; FEMA, 2013; Sheehan et al., 2016; City of Sanibel, 2013
				Provide for the termination of maintenance on roads where the cost to maintain exceeds the Fair Market Value of the properties it serves.	Maryland Working Group	S	Coastal Floodplain Overlay Zone	Grannis, 2011

				Locate roads servicing new development above the base flood elevation.	The City of Lewes Hazard Mitigation and Climate Adaptation Action Plan. June 2011		Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
				Map streets and require planning for certain mapped roads to anticipate more frequent flooding. Create a list of streets that routinely flood.	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions; Portsmouth Virginia Floodplain Management Plan and Repetitive Loss Plan. 2010		Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
				Integrate soft armoring (natural infrastructure) for roadways on the water's edge.			Waterfront Properties	Donaldson, 2019
			Drainage					
				Require more underdrains/cross-drains to allow for drainage.	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions		Coastal Floodplain Overlay Zone	Environmental Resources Management, 2011
				Demonstrate that drainage or pumping will not deplete groundwater or cause saltwater intrusion, in residential development on shorelines subject to tidal action.	Pacific County, Washington: SMP Ocean Coast Requirements	I	City-wide	Land Use Law Center, ND
			Materials					
				Use more durable base materials for roads to withstand periodic flooding and improve road bedding as groundwater levels rise.	Somerset County Rising Sea Level Guidance. Maryland Jurisdictions			Environmental Resources Management, 2011
	THE CITY OF TAMPA PAVEMENT RESTORATION REQUIREMENTS							
		N/A						
	TRAFFIC IMPACT ANALYSIS AND MITIGATION PLAN PROCEDURES MANUAL							
		N/A						
	LOCAL MITIGATION STRATEGY							
		Education, Management and Planning						
				Provide edcational materials on flood-proofing buildings.		S	Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
				Provide public education to encourage retrofitting of structures that do not meet floodproofing or elevation, standards, based on continued remapping of flood probabilities, combined with financial assistance or incentives and stringent rebuild policies.	Worcester County Sea Level Rise Guidance. Maryland Jurisdictions	S	Coastal High Hazard Area or Flood Resiliency Zone	Environmental Resources Management, 2011
				Encourage local building inspectors and conservation agents to work together to provide understandable advice to homeowners and commercial property owners about what can and cannot be built on coastal lots.	Massachussetts Coastal Hazards Commision	S	Coastal Floodplain Overlay Zone	Grannis, 2011
				Provide inspection services to homeowners to help identify ways in which they could retrofit their homes to make them more resilient to sea-level rise.	My Safe Florida Home Program	I	Coastal Floodplain Overlay Zone	Grannis, 2011
		Projects						
				Utilize the project list to mitigate future hazards.		I	City-wide	Grannis, 2011
	POST DISASTER REDEVELOPMENT PLAN							
				Undertake a comprehensive reevaluation of the state's post-storm redevelopment policies in light of sea level rise scenarios.	Florida Action Team	S	x	Grannis, 2011
				Outline a post-disaster permitting process that facilitates repairs but remains steadfast to the need to mitigate against future disasters, in coastal communities.	Town of Duck, North Carolina: Moratorium on Rebuilding and Reconstruction	I	x	Land Use Law Center, ND
				Create a reconstruction task force to review damage reports and advice the town council on reconstruction, rezoning, and innovative mitigation measures.	Town of Duck, North Carolina: Moratorium on Rebuilding and Reconstruction	I	x	Land Use Law Center, ND

		Retrofit Requirements					
			Require destroyed structures, major damaged structures, and minor damaged structures to a post-storm survey and/or site plan of the lot and proposed structure, where the original structure was destroyed or where an increase in the footprint of the pre-storm structure is proposed; a site plan approval; on-site inspection of the lot by zoning administrator; all debris removed from the lot; a septic improvements permit; and certain setbacks dependent on the extent of damage.	Town of Nags Head, North Carolina: Hurricane and Storm Reconstruction and Redevelopment & General Use Standards for Redevelopment in Ocean Hazard Areas	I	Coastal High Hazard Area or Flood Resiliency Zone	Land Use Law Center, ND
		Moratorium Regulations					
			Require that land bordering incipient inlets- ocean -to-sound inlets that may form or be altered as a result of a damaging storm-may be declared a high hazard area, with no building permits issued until the inlet has stabilized.	Town of Duck, North Carolina: Moratorium on Rebuilding and Reconstruction	I	Near inlets	Land Use Law Center, ND
			Achieve planned abandonment by prohibiting post-storm reconstruction, or by requiring relocation landward of the revised post-storm setback control line.			Areas of Relocation	Neal, 2019
			Discourage rebuilding after storms by denying of flood insurance and other subsidy programs.			FEMA	Neal, 2019
			Utilize long-term relocation by community zoning or land-use plans that identify a frontal zone of buildings likely to be impacted by known erosion rates or predicted flood levels from storm surge and coastal flooding.			Areas of Relocation	Neal, 2019
			Enact post-storm measures that include building moratoriums, policies on reconstruction, and a program for rapid acquisition of land.	Nags Head, North Carolina: managed retreat at work	I	Areas of Relocation	Neal, 2019
			Give local agencies independent authority to impose conditions on land use approvals to mitigate the potential negative environmental impacts of proposed projects.	Environmental Review under State Environmental Policy Act (SEQRA)	I	x	Land Use Law Center, ND
	TAMPA PORT AUTHORITY MARINE CONSTRUCTION PERMITTING SUMMARY						
		N/A					
	ENVIRONMENTAL PROTECTION COMMISSION						
		Maintenance					
			Minimize impacts from storm surge of existing and future natural resource lands, wildlife habitat, and agricultural lands through maintenance.	Anne Arundel County Background Report on Sea Level Rise, General Development Pan 2008. Maryland Jurisdictions	S	x	Environmental Resources Management, 2011
		Riparian Vegetation Landscape Ordinance					
			Require that new development and redevelopment for non-water-dependent uses abutting marine shorelines must include, in the site plan, beds of riparian vegetation in the 15-foot-wide strip of land lying immediately landward of unarmored shorelines or on the landward edge of shoreline armoring. Beds must be a minimum of six feet wide and ten feet long and must occupy a minimum of 50% of the shoreline's footage for new development and 25% for redevelopment.	Anacortes, Washington: Riparian Vegetation Landscape Ordinance	I	Waterfront Properties	Land Use Law Center, ND
			Identify salt-tolerant riparian species on the landscape plan and approved by a biologist/riparian plant specialist.	Anacortes, Washington: Riparian Vegetation Landscape Ordinance	I	Waterfront Properties	Land Use Law Center, ND
			Remove non-native species from planting beds.	Anacortes, Washington: Riparian Vegetation Landscape Ordinance	I	Waterfront Properties	Land Use Law Center, ND
			Encourage riparian vegetation.	Anacortes, Washington: Riparian Vegetation Landscape Ordinance	I	Waterfront Properties	Land Use Law Center, ND
		Tidal Wetlands Act					

				Require a permit for any dredging, filling, construction, or other activity within or immediately adjacent to inventoried tidal wetlands which may substantially alter or impair the natural condition of the tidal wetland area.	New York State Tidal Wetlands Act	I	Wetland Areas	Land Use Law Center, ND
				Enter into cooperative agreements with local governments for the protection of tidal wetlands. Provide, in the agreements, that the wetlands be preserved or maintained in their natural or enhanced state, except for local operation or lease of shellfish beds.	New York State Tidal Wetlands Act	I	x	Land Use Law Center, ND
				Situate roads other infrastructure and most new construction at least 75 feet from a tidal wetland.	New York State Tidal Wetlands Act	I	Wetland Areas	Land Use Law Center, ND
				Monitor wetland boundary locations and based on this, gauge wetland movement and take appropriate measures to ensure that wetlands can naturally retreat rather than drown.	Town of East Hampton, NY: Coastal Management Element	I	Wetland Areas	Land Use Law Center, ND
		Coastal Marshland Protection Act						
				Require a permit for any construction that could affect the salt marsh, such as marinas, community docks, bridges, dredging and bank stabilizations.	The Coastal Marshlands Protection Act	I		Samuel, 2020; Georgia Department of Natural Resources, ND; Greenlaw, 2019
		Shore Protection Act						
				Regulate activities and structures in jurisdictional beach and shore areas.	The Shore Protection Act	I	N/A	Department of Natural Resources, GA
				Require Coastal Erosion Management Permits for construction and other activities that occur within a designated erosion hazard area or for projects such as beach renourishment, rock revetments, landscaping, dune crossovers, or any structure in the jurisdictional areas and any modification to any such structure.	The Shore Protection Act	I	Waterfront Properties	Department of Natural Resources, GA
	SOUTH WEST FLORIDA WATER MANAGEMENT DISTRICT (SWFWMD) ENVIRONMENTAL RESOURCE PERMIT (ERP) DOCUMENTS							
		N/A						
	FLORIDA ADMINISTRATIVE CODE & FLORIDA ADMINISTRATIVE REGISTER: MITIGATION BANKS							
		N/A						
	CHAPTER 163: INTERGOVERNMENTAL PROGRAMS (STATE STATUTES)							
				Encourage or require that local governments use an extended planning time frame (e.g., planning for future development over the next 50 years, rather than the current practice of only planning for the next 10 to 20 years).		S	x	Grannis, 2011
				Coordinate between local governments and regional organizations to provide for regional adaptation planning.	California Climate Adaptation Strategy	S	x	Grannis, 2011
				Add a sea level rise component to state land use plan guidelines, specifically requiring characterization of how local governments will address the relocation of oceanfront properties should sea level rise continue at its present rate or at an increased rate.	North Carolina Coastal Resources Commission	S	x	Grannis, 2011
				Require local governments to adopt local coastal programs that, among other things, ensure that new development minimizes risk in areas of high geologic and flood hazard, does not contribute to erosion, does not require construction of armoring, and does not substantially alter natural landforms.	California Coastal Act	I	x	Grannis, 2011
				Authorize financial support for grants and loans to municipalities and counties to acquire lands in coastal areas for recreation and conservation purposes	New Jersey Coastal Blue Acres Program	I	x	Grannis, 2011

				Develop a long-term statewide program to prioritize high risk floodplain areas for conservation through acquisition and easement.	New York has incorporated consideration of SLR in its Open Space Conservation Plan	I	x	Grannis, 2011; Neal, 2019