Sea Level Rise Ready:
Model Comprehensive Plan Goals, Objectives and Policies, to Address Sea-Level Rise Impacts in Florida

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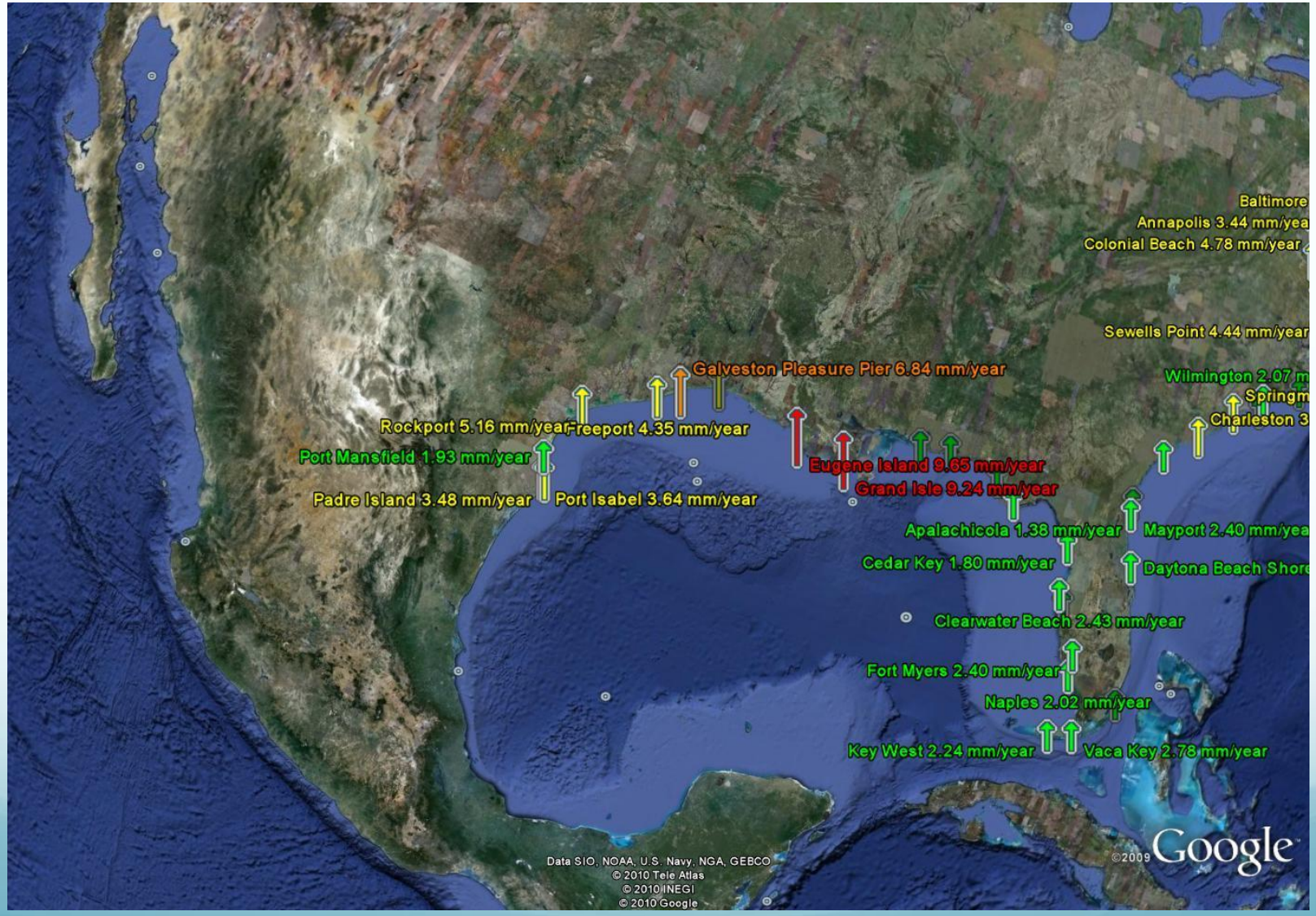
Overview of Presentation

- The purpose of the presentation is to present **selected** model comprehensive planning goals, objectives, and policies (GOPs) to address sea-level rise adaptation in a hypothetical city/county in Florida (Southwest Florida).
  - "Best Policy Practices" offer examples from other jurisdictions that illustrate the use of the policy
  - Concluding Low hanging policy fruit section suggests "low or no regrets" actions than can be taken now and in many cases already have been taken by one or more local jurisdictions
  - Detail, including commentary and annotations are provided in a forthcoming paper at:
  - http://www.law.ufl.edu/conservation/projects/coastal.shtml

Sea-Level Rise

- Refers to eustatic and relative Sea Level Rise (SLR)
  - Eustatic: a change in global average sea level brought about by an increase in the level of the ocean relative to the land
    - IPCC estimates sea level rise between 0.6 – 2.0 feet in the next 100 years
  - Relative: local increase in the level of the ocean relative to the land, which might be due to ocean rise and/or land level subsidence
    - Can vary substantially over relatively short coastal stretches

Relative Sea Level Rise in the Gulf and South Atlantic



Sea-Level Rise Impacts

- Periodic flooding and permanent inundation
  - “a whole new floodplain”
- Coastal squeeze
  - Coastal ecosystem migration halted by engineered shoreline defenses
- Shoreline recession
  - Inland migration of natural shorelines
- Ecosystem transformation
  - Shift in aereal extent of coastal habitats and habitat relationships
- Saltwater intrusion
  - Inland migration of salt/fresh surface and groundwater interface

The SLR Planning Challenge

Long Range Planning in the face of key uncertainties

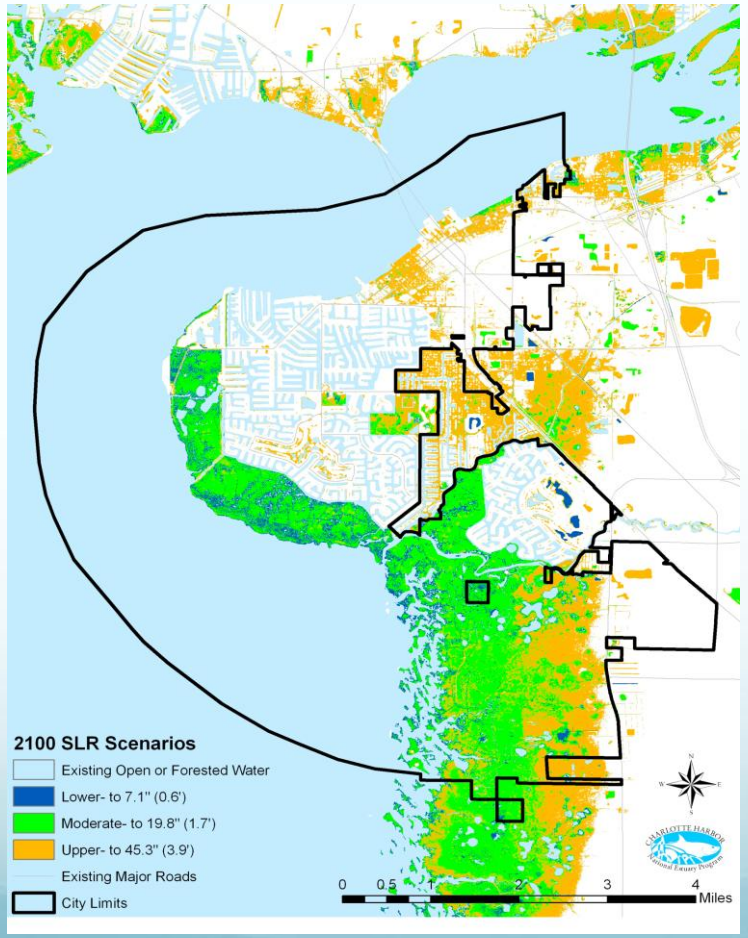
- How much SLR (Scaling down to address locally relevant SLR)
- Where – Models & Mapping (data and analysis)
- When – Stretching the Planning Horizon

4 Primary Goals

- An overarching goal of developing the spatial and temporal context for sea-level rise adaptation planning in the City/County based on relative vulnerability to SLR –
  - Goal 1Creates a “Vulnerable Area” temporal and spatial planning overlay
- 3 substantive goals based upon the generally accepted tripartite framework for SLR adaptation planning (IPCC) –
  - Protection (goal 2)
  - Accommodation (Goal 3)
  - Managed Relocation (Goal 4)
- Each goal serves as the basis for a separate zone within the Vulnerable Area Overlay
- Objectives and policies are not necessarily mutually exclusive by zone, though they are not repeated

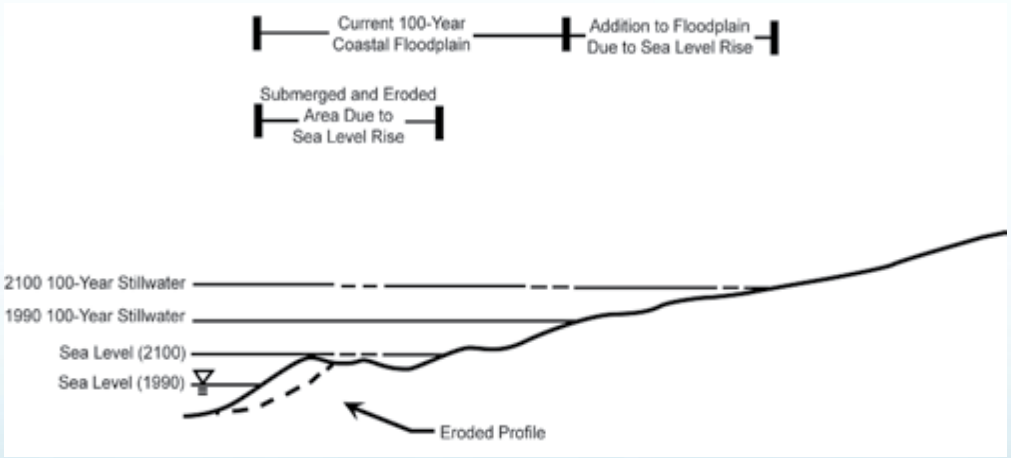
Sea-Level Rise Policy Continuum

Goal 1: [General] To develop the temporal and spatial context for sea-level rise adaptation planning in the City/County



- **<u>Objective 1.1</u>: [Spatial Overlay]** To identify the areas of the City that are vulnerable to level rise where the protection, accommodation, and retreat strategies should be used.

  - <u>Vulnerable Area defined</u>: The vulnerable area represents the area that encompasses the cumulative geographic reach of all sea level rise impacts projected for the planning horizon(s) as determined through data and analysis. The vulnerable area can encompass areas not currently identified as flood hazard areas (e.g. a future floodplain)



  - *<u>Best Recommended Policy Practice</u>: The Rockingham Planning Commission, New Hampshire has recommended creating an "extended coastal flood hazard overlay" to account for future flooding.*

Objective 1.1: To identify the areas of the City that are vulnerable to level rise where the protection, accommodation, and retreat strategies should be used. .

Policy 1.1.2: **[SLR Zoning]** The City/County shall use data and analysis to establish a SLR adaptation overlay district encompassing all areas within the City that are vulnerable to SLR consisting of three coastal zones.

A. SLR Adaptation Overlay **Protection** Zone
B. SLR Adaptation Overlay **Accommodation** Zone
C. SLR Adaptation Overlay **Managed Relocation** Zone

**Best Policy Practice: Town of East Hampton, New York – Coastal Erosion Overlay District*

Objective 1.1: To identify the areas of the City that are vulnerable to level rise where the protection, accommodation, and retreat strategies should be used.
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- Policy 1.1.2: **[SLR Notice]** To require all sellers of real property within the SLR Overlay District to provide **notice** to purchasers that structures and properties are located within an area that is vulnerable to sea level rise within the planning horizon

  - *Best policy practice:*
    - *Texas, Section 61.025, Texas Natural Resources Code – Disclosure Notice Concerning Legal and Economic Risks of Purchasing Real Property Near a Beach*
    - *Florida, Section 161.57, Florida Statutes – Coastal Properties Disclosure Statement*

Objective 1.2: **[Temporal]:** To expand planning horizons for sea-level rise adaptation to capture the anticipated impacts of SLR based on current SLR models

Policy 1.2.1: **[Planning Horizon]** Utilize a (___) year planning horizon when considering the adoption of any protection, accommodation, and managed retreat strategy within the City/County.

Comment: *Under Florida law local governments must develop planning horizons based on a 10 year interval for most planning purposes. Some transportation and infrastructure planning occurs on longer planning horizons. Current law does not preclude longer planning horizons should a local government choose to adopt them.*

Best Policy Practice: The Rockingham Planning Commission ***recommended*** *that the Town of Seabrook, New Hampshire incorporate a minimum of a 50 year planning horizon and assuming a 1.5 foot rise in sea levels within that period, and at least a 3 to 5 foot rise in sea level over 100 years for all basic planning, zoning, and permitting decisions.*

- **Objective 1.3**: [**SLR-Ready]:** To ensure that consideration has been given to whether existing and planned public and private infrastructure and land development within the vulnerable area is “sea-level rise ready”

  Policy 1.3.1: **[Infrastructure Inventory]** The City/County shall inventory all existing and planned infrastructure and land development within the vulnerable area for its capacity to accommodate projected sea-level rise over the life expectancy of the infrastructure and development.

  Policy 1.3.2: **[SLR-Ready Review]** No capital improvements within the vulnerable area shall be financed or constructed without having first been reviewed to determine the extent to which the proposed improvement is sea-level rise-ready, taking into account the sea-level rise adaptation zone in which it is located, and whether it will contribute to additional development within the vulnerable area.

  Best Policy Practice: Kings County, Washington - Systematic review of 27 wastewater treatment plants for sea level rise impacts, with conclusions and recommendations

- **GOAL 2: [<u>Protection</u>.]**To ensure adequate protection of the built environment through soft and hard shoreline stabilization that seeks to maintain a static shoreline position within the City/County.

  - *<u>Protection Defined</u>: Protection means the use of any means of constructed physical barrier or other managed system to prevent the landward migration of tidally influenced water bodies*

Hard Stabilization

Soft Stabilization

[Protection] Considerations

Advantages

- Protects important private and public infrastructure
- Creates investor certainty
- Can be used with other strategies

Disadvantages

- Requires long-term maintenance
- May be unsustainable (depending on SLR rates)
- Ecologically problematic
- Loss of sandy beaches, coastal squeeze

- **Objective 2.1: [Inventory]** To identify areas of the built environment vulnerable to sea level rise where shoreline stabilization strategies will be appropriate

  - Policy 2.1.1: **[Protection Strategy]** The City/County shall 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.

Comment: A recent EPA funded study developed maps that depict which developed lands are likely to be protected along the U.S. Atlantic Coast. Environ. Res. Lett. 4 (2009) 044008 (7pp). An effort like this could be scaled to the City/County level.

- **Objective 2.1: [Inventory]**To identify areas of the built environment vulnerable to sea level rise where shoreline stabilization strategies will be appropriate

  - Policy 2.1.2: Based on projected rates of sea level rise within the SLR planning horizon the City shall inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.

  - Policy 2.1.3: The City/County shall inventory all public buildings and infrastructure that are vulnerable to sea level rise within the SLR planning horizon and determine whether such buildings and structures should be protected through shoreline stabilization.

- **Objective 2.2: [Mitigation]** To compensate for the loss of ecosystem services resulting from hard shoreline stabilization in the City/County

  - Policy 2.2.1: The City/County shall require adequate mitigation for shoreline stabilization through the construction of living shorelines in front of hard shoreline stabilization structures where it is feasible do so.

    - *Living shorelines defined: "Living Shorelines" are shoreline management options that provide erosion control benefits, while allowing for natural coastal processes to remain through the strategic placement of organic and inorganic material to reduce wave energy and create or recreate appropriate riparian and near shore habitat*

    - *Best Policy Practice: Collier County, Florida requires that the natural functions of developed shorelines be restored and maintained and that "development and redevelopment proposals must consider the implications of potential sea level rise." (Objective 10.4; Policy 10.4.13)*

GOAL 3: [Accommodation]

To accommodate increasing sea levels and the additional flooding that will result by adapting the built environment and enhancing the resiliency of the natural environment where it is economically and ecologically practicable to do so

**Comment: Accommodation contemplates a suite of policy tools that emphasize maintaining and adapting components of the built environment to periodic and permanent inundation over time. Accommodation policy also emphasizes retention and expansion of existing and potential floodways to manage flooding and to facilitate coastal ecosystem migration through and around the built environment.*

Floating Bridge - Seattle, WA

Floating House – Brad Pitt's Make it Right Foundation, New Orleans, LA

Multi-family floating canal houses - Scheepstimmermanstraat, Amsterdam

House on stilts – New Orleans, LA

[Accommodation] Considerations

Advantages

- Allows development to proceed in transition areas and where SLR is uncertain – threat of sea level rise is prolonged
- Minimizes damage

Disadvantages

- Increases vulnerability
- Alters the characteristics of shorelines
- *Short-term solutions* that eventually lead to protection or managed relocation strategy

Objective 3.1: **[Built Environment]** To assure that all aspects of the built environment within the accommodation zone can withstand additional permanent or periodic inundation based on sea level rise projections through structural and non-structural solutions.

- *Comment: To a significant extent existing floodplain regulations already contemplate, indeed encourage, accommodation within the built environment.*

- *Best Policy Practice: The Cape Code Commission Model Floodplain District Bylaws explicitly provides that the regulations are intended to address not only current flood hazards, but future flood hazards based on sea level rise projections.*

- **Objective 3.1**: **[Built Environment]** To assure that all aspects of the built environment within the accommodation zone can withstand additional permanent or periodic inundation based on sea level rise projections through structural and non-structural solutions.
  - Policy 3.1.1: **[Performance Standards]** The City/County shall require all new construction within the Accommodation Zone to adhere to performance standards designed to enable development to withstand permanent and/or temporary inundation due to rising sea levels….
    - *Best Policy Practice: Cape Code Commission's model bylaws require 1 – 2 feet elevation above Base Flood Elevation to account for projects SLR*

- **Objective 3.2: [Land Use]** To reduce the density and intensity of development and redevelopment in the accomodation zone landward of unprotected shorelines

  - Policy 3.2.1 **[Down-planning/Down-zoning]** The City/County shall limit the residential density within the accommodation zone to no more that __ units per acre.

    - *<u>Best Policy Practice:</u> St. Tammany Parrish in Louisiana undertook a comprehensive rezoning that was completed after Hurricane Katrina. Floodprone areas that were previously zoned for residential or commercial development were down-zoned to lesser densities or rezoned for conservation and land uses compatible with periodic inundation.*

- **Objective 3.2: [Land Use]** To reduce the density and intensity of development and redevelopment in the accommodation zone landward of unprotected shorelines

  - Policy 3.2.2 **[Low Impact Development Practices]** The City/County shall develop design guidelines that promote compact development and redevelopment that maximizes the use of floodways and flood storage within the zone of accommodation.

    - *Best Policy Practice: The Town of Marineland requires new development to provide 50% additional stormwater storage capacity than currently required by law.*

- **Objective 3.2: [Land Use]** To reduce the density and intensity of development and redevelopment in the accomodation zone landward of unprotected shorelines

- Policy 3.2.2: **[Limitation on Building Footprint]** The City/County shall limit the building footprint for all new residential structures within the accommodation zone to (__) square feet and commercial structures to (____) square feet.

  - *Best Policy Practice: The Maine Dune Rule (Code of Maine Rules Chapter 355)* ***requires planning for two feet of sea level rise*** *over the next one hundred years. Maine's rule requires that no building taller than 35 feet or having a footprint greater than 2,500 square feet can be constructed within the dune system unless the applicant can demonstrate "by clear and convincing evidence that the site will remain stable after allowing for* ***a two-foot rise in sea level over 100 years****." The rule explicitly states that "[r]eliance upon an existing seawall is not sufficient as evidence of site stability."*

- **Objective 3.3 [The Natural Environment]** To facilitate coastal ecosystem migration through the maintenance and restoration of adequate open space within the zone of accommodation.

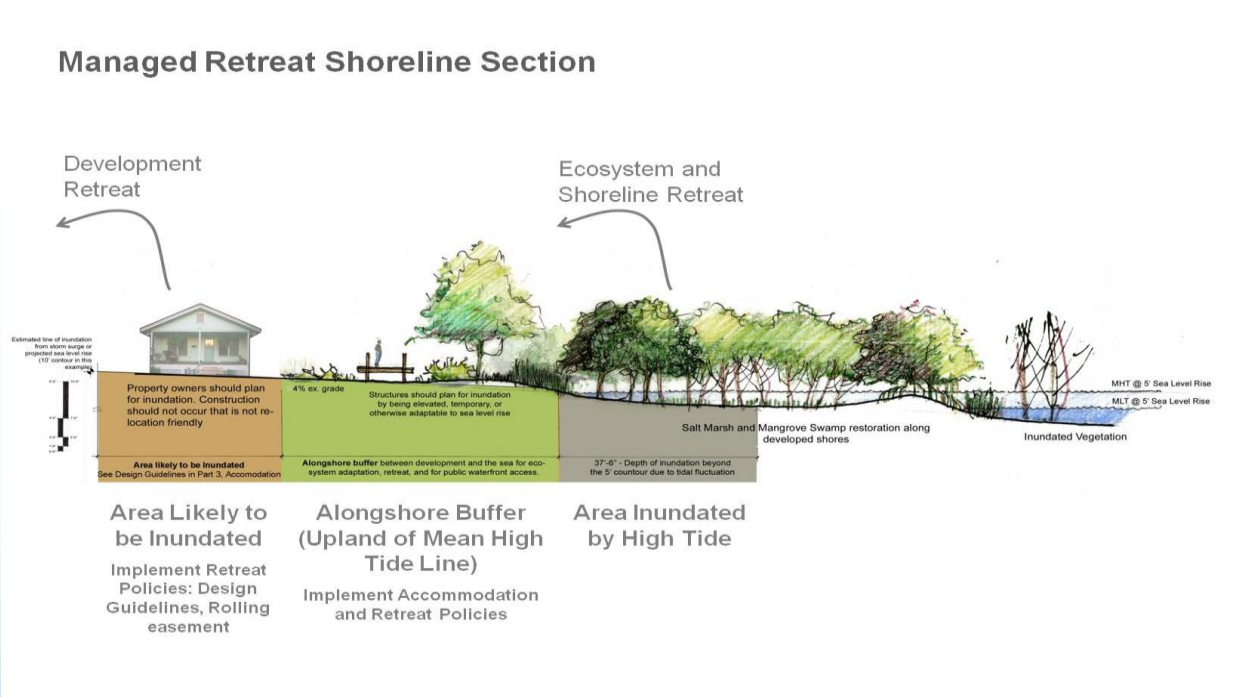
  - Policy 3.3.1: **[Riparian Buffers]** The City/County shall establish riparian buffers that reflect projected rates of sea level rise within the planning horizon for all tidally influenced water bodies . Such buffers shall be designed to allow the conversion of adjacent uplands to wetlands while retaining transitional ecotones where ecologically feasible.

- **Objective 3.3 [The Natural Environment]** To facilitate coastal ecosystem migration through the maintenance and restoration of adequate open space within the zone of accommodation.

  - Policy 3.3.2: **[Conservation Land Acquisition Priority]** The City/County shall develop priority areas for land acquisition based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration.

    - *Best Policy Practice: The State of Connecticut's Coastal and Estuarine Land Conservation Program provides for consideration of upland suitability for landward migration of wetlands due to sea level rise in its land acquisition program priority ranking system.*

Goal 4: [Managed Relocation] To Reduce vulnerability in the built environment and preserve coastal ecosystems through changes in land use and the orderly abandonment and /or landward relocation of structures and associated infrastructure



Managed Relocation Considerations

Advantages

- Promotes ecosystem migration
- Minimizes threats to humans
- Financially sustainable in the long-term
  - Potentially expensive for areas that are significantly developed

Disadvantages

- Politically problematic to implement
- May be subject to legal challenge
- Relocation issues

- **Objective 4.1**: **[Land Use]** To reduce the density and intensity of future land use along unprotected shorelines within the managed relocation zone

  - Policy 4.1.1: Within the managed relocation zone, 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

    - *Comment: "*while uncertainty remains about the magnitude and timing of sea level rise, development decisions that are being made today are committing public and private capital to land use patterns and associated infrastructure and facilities with design lives that reach well into the period of time when the impacts of sea level rise will be felt." (Deyle, et al., Adaptive Response Planning to Sea Level Rise in Florida and Implications for Comprehensive and Public-Facilities Planning, available at: http://www.gulfofmexicoalliance.org/working/coastal_resil/slr_comm_response.pdf)

Objective 4.1: [Land Use] To reduce the density and intensity of future land use along unprotected shorelines within the managed relocation zone

- Policy 4.1.1: Within the managed relocation zone the City/County shall reduce residential land use densities to no more than __ units per acre and commercial structures to ____ square feet per acre.

  - *Comment: This may require downzoning or downplanning current densities and intensities with the proposed overlay zone. Downzoning and down-planning can be controversial and give rise to legal claims, though courts have generally upheld them where they are supported by data and analysis and represent sound public policy, broadly applied.*

- **Objective 4.1: [Land Use]** To reduce the density and intensity of future land use along unprotected shorelines within the managed relocation zone

  - Policy 4.1.3: The City/County shall create a **transferable development rights** program within the managed relocation overlay that transfers densities and intensities outside of the managed relocation zone.

    - *Best Recommended Policy Practice: The City of Crystal River has recently proposed amending its Comprehensive Plan to require the transfer of development rights (2 residential units per 2 acres) out of its "Coastal Protection" land use category.*

- **Objective 4.2**: **[Shoreline Migration]** To preserve coastal ecosystems by ensuring that natural shoreline migration processes may continue unimpeded.

  - Policy 4.2.1: The City/County shall prohibit **hard shoreline stabilization** techniques within Managed Relocation Zone

    - *Best Policy Practice: North Carolina law provides: "no person shall construct a permanent erosion control structure in an ocean shoreline…."N.C. GEN. STAT. § 113A-115.1(b) (2003)*

    - *Best Policy Practice: Sarasota County prohibits shoreline hardening or the construction of shore protection structures unless it is found to be in the public interest. Shoreline hardening or shore protection structures cannot "impede public access to beaches, must minimize adverse impacts to coastal processes and resources, neighboring properties, and the values and functions of the beaches and dune systems, and provide mitigation where determined . . . to be appropriate."* (SC Code 48-39-290(D)(1))

- **Objective 4.2**: **[Shoreline Migration]**To preserve coastal ecosystems by ensuring that natural shoreline migration processes may continue unimpeded.

- Policy 4.2.1: **[Rolling Setback]** The City/County shall establish an erosion-based minimum setback for shoreline development within the managed relocation zone based upon the (annual coastal erosion rate) x (a planning period representing the economic lifetime of the coastal structure) + (an additional buffer)

  - *Best Policy Practice: Kaua'i Shoreline Setback, Kaua'i County, Hawaii (Structural lifetime multiplier = 70 or 100 years x annual erosion rate, Storm and safety buffer = 40 feet)*

- **<u>Objective 4.2</u>**: **[Shoreline Migration]** To preserve coastal ecosystems by ensuring that natural shoreline migration processes may continue unimpeded.

  - Policy 4.2.2: **[relocation convenant]** All permits for new development within the managed relocation zone shall include, as a condition of development approval, a covenant or other real property instrument that runs with the land, that requires the abandonment and removal of structures and fixtures once they are inundated for at least __ months per year, or are no longer habitable as determined by the building official, whichever comes first.

    - *Best Policy Practice: The State of South Carolina authorizes construction or reconstruction of structures seaward of a fixed setback provided that the owner agrees to relocate the structure should it become located on the active beach due to subsequent erosion. (*SC Code 48-39-290(D)(1))

Aliomanu Bay in Kaua'i, Hawaii

Shoreline Impacts, Setback Policy & Sea Level Rise, Center for Island Climate Adaptation and Policy - Photo by: Dennis Fujimoto – Garden Island News.

Objective 4.3: **[Land Acquisition]** To develop programs to encourage abandonment of undeveloped properties and relocation of existing structures within the "Managed Relocation Zone" consistent with projected rates of shoreline recession over the SLR planning horizon.

- Policy 4.3.1: **[SLR Acquisition priorities]** The City/County shall prioritize and seek to acquire properties or interests in properties within the managed relocation zone based on their relative vulnerability to SLR and the extent to which they may impede coastal ecosystem migration.

  - *Best Policy Practice: A 2008 amendment to the Florida Forever legislation makes properties subject to sea level rise eligible for state land acquisition funding. Section 259.105 (17)(d), Florida Statutes*

- Policy 4.3.2: **[Upland land bank established]** Identify and establish **a land bank** for the purposes of relocating critically important infrastructure and municipal support facilities outside of the vulnerable area.

- **Objective 4.3**: **[Land Acquisition]** To develop programs to encourage abandonment of undeveloped properties and relocation of existing structures within the "Managed Relocation Zone" consistent with projected rates of shoreline recession over the SLR planning horizon.
  - Policy 4.3.3: **[Rolling Conservation Easement].** The City/County shall promote the acquisition of rolling conservation easements within the managed relocation zone

  - *Comment: 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.*

Retreat in Action...

Andy Coburn, Center for Developed Shorelines

Low Hanging Policy Fruits

Goal 1 – DEVELOP SPATIAL AND TEMPORAL CONTEXT

- **VULNERABLE AREA SPATIAL OVERLAY AND PLANNING HORIZON** – Create a vulnerable area overlay based on the landward extent of projected sea level rise impacts over a selected planning horizon.
  - Rockingham Planning Commission

- **SLR READY INFRASTRUCTURE INVENTORY –** The City/County shall inventory all existing and planned infrastructure within the vulnerable area for its ability to accommodate projected sea-level rise over the life of the infrastructure. (Policy 1.3.1)

- **SLR NOTICE** – To require all sellers within the SLR Overlay District to include a notice provision that such structures and properties are located in within the SLR Overlay District and are or may be subject to SLR strategies specific to the zone within which such properties are located. (Policy 1.1.3)

Low Hanging Policy Fruits

- **GOAL 2: PROTECTION**

  - **STABILIZATION STRUCTURE INVENTORY**– 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. (Policy 2.1.2)

  - **LIVING SHORELINES MANDATE -** Require a living shorelines buffer where appropriate and ecologically feasible (Policy 2.3.1)

Low Hanging Policy Fruits

- **GOAL 3: ACCOMMODATION**

  - **ELEVATED FREEBOARD** - Require the lowest floor of all new construction in vulnerable areas to be raised (__) feet above the predicted flood elevations provided by the Federal Emergency Management Agency. (Policy 3.1.3)

  - **CONSERVATION LAND ACQUISITION PRIORITY -** Develop priority areas for land acquisition based on their strategic capacity to absorb floodwaters and support coastal ecosystem migration. (Policy 3.3.2)

  - **LOW IMPACT DEVELOPMENT PRACTICES -** Develop design guidelines that promote compact development and redevelopment that maximizes the use of floodways and flood storage within the zone of accommodation. (Policy 3.2.3)

Low Hanging Policy Fruits

- **GOAL 4: MANAGED RELOCATION**
  - **TRANSFERABLE DEVELOPMENT RIGHTS -** create a **transferable development rights** program within the managed relocation overlay that transfers densities and intensities outside of the managed relocation zone. (Policy 4.3.1)
  - **LAND ACQUISITION -** Prioritize and seek to acquire properties or interests in property within the managed relocation zone (Policy 4.4.1)

Thank you!

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