How to Incorporate Sea-Level Rise Adaptation Assessment Tools and Resources into Local Planning
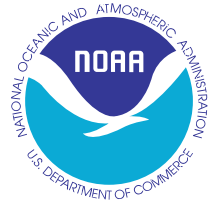
Acknowledgements

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This document is excerpted from the "Sea-Level Rise Vulnerability Assessment Tools and Resources: A Guide for Florida's Local Governments." The larger guidebook provides guidance for approaching, developing, and completing sea-level rise risk and vulnerability analyses and scenarios and for incorporating the appropriate process and process outputs into local planning efforts.

This document describes how the sea-level rise vulnerability tools inventoried in the *Sea-Level Rise Vulnerability Assessment Tools and Resources* guidebook can be incorporated into the following local planning efforts: local comprehensive plan, local mitigation strategy, special area management plan, economic development plan, post-disaster redevelopment plan, capital improvements plan, stormwater management plan, and historic preservation plan. A brief summary of each type of plan can be found below, and an explanation of how each of the identified sea-level rise vulnerability tools can be incorporated into those local planning efforts follows. A comparison crosswalk is also provided at the end of the document to summarize how all of the tools relate to the specific needs of each of the local planning efforts.

Local Comprehensive Plan

All of Florida's counties and municipalities are required to adopt local comprehensive plans that guide future growth and development. Local comprehensive plans establish policies that are intended to guide a community's day-to-day land use decisions and capital facilities expenditures. These policies have a major impact on whether people and property are exposed to natural hazards as well as the extent to which they are vulnerable to injury and damage.

Local Mitigation Strategy

In Florida, a local mitigation strategy (LMS) is often a multi-jurisdictional plan developed collaboratively at the county level to reduce and/or eliminate the risks associated with natural and man-made disasters. The LMS identifies existing and potential hazards and proposes actions that would mitigate losses caused by those hazards. By identifying these vulnerabilities and proposing solutions for them, communities are able to prevent losses to lives and property.

Special Area Management Plan

A special area management plan (SAMP) is a comprehensive plan providing for natural resource protection and reasonable coastal-dependent economic growth containing a detailed and comprehensive statement of policies, standards, and criteria to guide public and private uses of lands and waters as well as mechanisms for timely implementation in specific geographic areas within the coastal zone. SAMPs provide for increased specificity in protecting natural resources, reasonable coastal-dependent economic growth, and improved protection of life and property in hazardous areas, including those areas likely to be affected by sea-level rise, as well as improved predictability in government decision making.

Economic Development Plan

An economic development plan provides a comprehensive overview of the economy, sets policy direction for economic growth, and identifies strategies, programs, and projects to improve the local economy. These policies and strategies can guide future investment and economic growth or activities to areas that are safe and that have reduced exposure to hazard risks.

Post-Disaster Redevelopment Plan

A post-disaster redevelopment plan (PDRP) is encouraged for all communities. A PDRP identifies policies, operational strategies, and roles and responsibilities for implementation that will guide decisions that affect long-term recovery and redevelopment of a community after a disaster. PDRPs emphasize seizing opportunities for hazard mitigation and community improvement consistent with the goals of the local comprehensive plan and with full participation of the citizens.

Capital Improvements Plan

A capital improvements plan (CIP) guides the scheduling of spending on public improvements, such as capital projects and equipment purchases. A CIP can serve as an important mechanism for guiding future investments and improvements away from identified hazard areas.

Stormwater Management Plan

A stormwater management plan is designed to address flooding associated with stormwater runoff. A stormwater management plan is typically focused on design and construction measures that are intended to reduce the impact of more frequently occurring minor urban flooding.

Historic Preservation Plan

A historic preservation plan is intended to preserve historic structures or districts within a community. An often overlooked aspect of the historic preservation plan is the assessment of buildings and sites located in areas subject to natural hazards and the identification of ways to reduce future damages.

The Local Comprehensive Plan

Local Comprehensive Plans in Florida require a Coastal Management Element by way of §163.3178, Fla. Stat., 2014. Within this section, they are held to create a coastal management element "based on studies, surveys, and data", and to create "an inventory map of existing coastal uses…and other areas of special concern to local government." A map of places where sea-level rise inundation or related flooding is projected to occur may comprise precisely those other areas of special concern.

Because the statute also prompts communities to incorporate environmental, socioeconomic, and fiscal considerations into the Coastal Management Element, the following tools are recommended in order to fulfill that requirement:

- Climate Central's Surging Seas Viewer
- NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer
- NatureServe Climate Change Vulnerability Index (CCVI)
- Sea-Level Affecting Marshes Model (SLAMM)
- Coastal Adaptation to Sea-Level Rise (COAST)
- Georgetown Climate Center

These five tools can provide a way to consider the social (Climate Central's Surging Seas and NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer, with socioeconomic vulnerability layer), environmental (CCVI and SLAMM), and built aspects of land vulnerable to sea-level rise (COAST). The Georgetown Climate Center database can be accessed to help compose the policies that would be included in the plan. As its name suggests, a major goal of this kind of plan is a comprehensive assessment of the interaction between the human and natural environment. The above visualizers, modeling tools, decision support tool, and database will assist a community to understand the planning context and the way in which sea-level rise will affect multiple kinds of assets.

The Local Mitigation Strategy

Local Mitigation Strategies are directed to assess and propose strategies to mitigate community hazards, which can include sea-level rise. The plan requirements of a local mitigation strategy facilitates the incorporation of sea-level rise analysis. Title 44 CFR §201.6 directs local governments to include:

"A risk assessment [with a] description of the type, location, and extent of all natural hazards that can affect the jurisdiction, [including] types and numbers of existing and future buildings, infrastructure, and critical facilities located in hazard areas; an estimate of the potential dollar losses to vulnerable structures; [and] a general description of land uses and development trends within the community."

Therefore, to incorporate sea-level rise as a hazard, it is important for the tool to consider buildings, infrastructure, and land use. In addition, the ability to calculate dollar losses is useful. For this reason, the following tools are recommended:

- Climate Central's Surging Seas Viewer
- Hazus-MH
- NatureServe Vista

While Climate Central's Surging Seas is accessible to all users, both Hazus-MH and NatureServe Vista demand some level of staff expertise to operate. Thus, a community may begin by viewing the property value and infrastructure ("Features") maps on Surging Seas and then progress to the other two tools in order to develop more precise community estimates of damage.

The Special Area Management Plan

Special Area Management Plans (SAMPs) cover a great breadth of options, but for the sake of this guide, focus will be directed at the Adaptation Action Area described by Section 163.3177 (6)(g) 10 , Fla. Stat., 2014. An Adaptation Action Area consists of a "designation for those low lying coastal zones that are experiencing coastal flooding due to extreme high tides...and are vulnerable to the impacts of rising sea level." Further, local governments who are considering implementing Adaptation Action Area policies are encouraged to analyze "coastal flooding resulting from high-tide events, storm surge, flash floods, stormwater runoff, and related impacts of sea-level rise."

In essence, the creation of this kind of SAMP requests that the overlay zone be accompanied by a general sea-level rise projection that can account for storm surge. Leaving the assets that may be impacted up to the community, recommended tools for supporting SAMP creation are:

- FDOT Sea Level Scenario Sketch Planning Tool
- NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer
- NOAA Inundation Analysis Tool
- ADvanced CIRCulation Model (ADCIRC)
- Georgetown Climate Center

The first two tools – FDOT Sea Level Scenario Sketch Planning Tool and NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer – are useful for characterizing the hazard. Should a community wish to convert screenshots of inundation to images and utilize those images to describe sea-level rise, it would be a valid method to illustrate inundation areas. NOAA's Inundation Analysis

tool can be used to compare how many high tides and total hours of inundation would have been experienced during a selected period of time assuming a given amount of sea-level rise versus the historical data. This will provide information on historical high tides as well as conditions that would be expected under a given amount of sea-level rise. The ADCIRC modeling tool will allow for a more sophisticated storm-surge analysis, but it requires a great deal of technical expertise to run properly and will likely necessitate additional support. Finally, the Georgetown Climate Center database can be accessed to help compose the policies that enter the Adaptation Action Area SAMP.

The Economic Development Plan

Sea-level rise poses economic and community development challenges, and it could impact transportation access, the environment, and resource availability. The Code of Federal Regulations approaches Economic Development from the vantage point of a Comprehensive Economic Development Strategy (CEDS). In Title 13 CFR §303.7, the regulation stipulates that communities must bring "an in-depth analysis of economic and community development problems and opportunities" to bear in the strategy. Among the goals and objectives, the Code requires strategies to include "fostering effective transportation access... enhancing and protecting the environment, [and] balancing resources through sound management of physical development."

In order to integrate sea-level rise assessment, communities may wish to pair the analysis of future economic development investments with a projection of sea-level rise. The following tools will support this analysis:

- FDOT Sea Level Scenario Sketch Planning Tool
- Integrated Valuation of Environmental Services and Tradeoffs (InVEST)
- U.S. DOT Vulnerability Assessment Scoring Tool (VAST)
- U.S. Climate Resilience Toolkit

These tools can boost the effectiveness of a local economic development plan in several ways. FDOT's Sea Level Sketch Tool will provide a baseline projection and inundation map of rise and show how it may affect transportation access and the built environment. If future investments fall within the inundation or flood range, it will show that as well. InVEST can display how coastal resources will be enhanced or degraded by development decisions – a consideration of utmost importance for many beach-based and tourism industry projects. U.S. DOT's VAST can help enhance the understanding of sea-level rise impacts on transportation access. Finally, the U.S. Climate Resilience Toolkit, like Georgetown Climate Center's library of resources, can inform the entire process and introduce new modes of thinking about the way in which long-term economic development will have to contend with future hazards.

The Post-Disaster Redevelopment Plan

Although the statutory framework that required communities to develop a post-disaster redevelopment plan (PDRP) has been repealed in Florida, the process is still furthered by the State's Emergency Support Functions (ESFs) and Recovery Support Functions (RSFs). Specifically, ESF 5, Information and Planning, could incorporate sea-level rise exacerbated storm surge projections within its Future Planning Unit[1] and Community Planning and Capacity Building Recovery Support Function.

A sea-level rise vulnerability assessment tool will assist emergency managers to promote transformative resilience, or the ability to build back stronger than before, in the event of coastal flooding. The usefulness of PDRP lies in its ability to spur ambitious change in the wake of a destructive disaster. So, rather than "No-Regrets" strategies that may be implemented in the present, this plan can utilize sea-level rise projections to direct where future development should be limited. Tools that can help to navigate the intersection between post-disaster planning, emergency response, and sea-level rise projection include the following:

- Georgetown Climate Center
- U.S. Climate Resilience Toolkit
- Geospatial Assessment Tool for Operations and Response (GATOR)
- Hazus-MH

Because much of post-disaster redevelopment remains an emergent policy issue in Florida, the Georgetown Climate Center and U.S. Climate Resilience Toolkit contain resources that can further a community's understanding of transformative resilience. GATOR can assist in the emergency warning for hurricanes and other storm-surge events. It also maps locations of critical infrastructure. Finally, Hazus-MH projections that account for the effect of future rises in sea-levels on storm surge may be utilized to map transfer of development rights (TDR) areas or other zoning and adaptation strategy focus areas.

The Capital Improvements Plan

The Capital Improvements Plan (CIP) translates the blueprint of Comprehensive Plan land use and community functions into the major projects that realize new community form and function. Section 163.3164(4)(d), Fla. Stat. (2014) requires that: "public services, including water, wastewater, transportation, schools, and recreation facilities…are scheduled in the capital improvement element."

As the schedule for amenities protecting the health and welfare of community members, it is essential the Capital Improvements Plan react to the influence of sea-level rise vulnerability assessment, programming large community infrastructure away from the scope of coastal flooding. For this plan, decision support tools may play a large role, as they can assist public works and planners to decide which projects will have the most positive benefit-to-cost ratio.

- SLAMM
- Beach-*fx*
- ADCIRC
- CommunityViz

[1] http://www.floridadisaster.org/emtools/documents/Future%20Planning%20Unit%20SOG.pdf

The CIP represents an adaptation planning stage when a high degree of detail and attention have been committed to understanding the effects of sea-level rise. As the plan directs multi-million dollar investments, modeling tools such as SLAMM will help to describe natural and built habitat changes that can inform how a project is scoped and designed. Beach-*fx* can directly examine the effects of a capital project, such as a levee, on natural coastal processes and estimate the costs and benefits of alternative project designs. Since it is a physics-based model, ADCIRC will provide the most accurate portrayal of exact locations where tides, surge, and other coastal water activity could damage structures. CommunityViz can also assist in cost-benefit considerations on a project by project basis.

Of note, these tools will likely need financing to be run locally. A specialist to input and interpret data and a license to run the program are needed for all of the above tools except Beach-*fx*, which is available for download at no cost.

The Stormwater Management Plan

Stormwater Management Plans address flooding caused by rainfall, passing through watersheds, and terminating at fresh and saltwater catchment areas (aquifers, rivers, lakes, estuaries, and oceans). Catchment areas' ability to absorb new inflow is crucial to the functioning of a stormwater system. Therefore, when the Florida Administrative Code states that "The primary goals of the State's stormwater management program are to maintain…during and after construction and development, the pre-development stormwater characteristics of a site" (Florida Administrative Code, 62-40.431 (2)(a)), the ability to project the impacts of sea-level rise could factor into the realization of this goal. Other objectives from the rule state:

"To reduce stream channel erosion, pollution, siltation, sedimentation and flooding…to maintain the appropriate salinity regimes in estuaries needed to support the natural flora and fauna; and to address stormwater management on a watershed basis."

With these directives in place, a community looking to integrate sea-level rise vulnerability assessment into a stormwater management plan will need to evaluate environmental changes that could be brought about by sea-level rise and impacts of flood hazards when combined with sea-level rise. For these activities, recommended tools include:

- NOAA Coastal Change Analysis Program (C-CAP)
- NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer
- Hazus-MH
- SLAMM
- Georgetown Climate Center

The NOAA C-CAP tool offers visualization and data download related to the change of community land use over time. This tool, utilized in conjunction with the NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer, can illustrate the ways in which land-cover change (to impervious surface) has concentrated near or within sea-level rise projection areas. Hazus-MH can potentially be used to illustrate exacerbated flood levels in the event of downpour mixed with future higher sea levels. SLAMM, by illustrating sea-level rise effects on estuarine habitats, can show pressures caused by adjacent development before and during storm events. Finally, Georgetown Climate Center, as for other plans, offers a strong database of policy options that can inform stormwater management plans that seek to strengthen the goals set forth in Florida Administrative Code 62-40.431.

The Historic Preservation Plan

Historic Preservation revolves around preserving a property's significance by way of ensuring that the integrity of significance-imparting property characteristics are protected or enhanced. Importantly, the National Parks Service[2] (responsible for the national registry of historic properties) states that historic significance can be achieved by virtue of "Distinctive physical characteristics of design, construction, or form." In relation to this form significance, the integrity can be altered by way of changes to the "location, design, setting, materials, workmanship, feeling, and association" of the property.

For historic properties situated near the coast, sea-level rise and associated coastal flooding can pose a threat to all seven qualities of integrity. Because historic properties take many forms – sculptures, open space, buildings, archeological sites, etc. – a detailed mapping of property locations, with a good exposure analysis that incorporates multiple types of flooding, is essential. For this task, the following tools are recommended:

- FDOT Sea Level Scenario Sketch Planning Tool
- Climate Adaptation Knowledge Exchange (CAKE)
- COAST

The projection add-in can be downloaded from FDOT's Sea Level Scenario Sketch Planning Tool and integrated into ArcGIS 10.1 or later versions. In addition, the Sketch Planning Tool offers digital sea-level rise inundation GIS data layers, by transportation district, for download. Thus, if the community obtains a detailed map shapefile of historic property locations, it can be combined with these the FDOT features to produce a map of vulnerable properties. CAKE offers case studies and the ability to connect to other communities. Through these options, a community who is undertaking historic property sea-level rise assessment may connect to others for specific information about vulnerability in the historic context. COAST can predict damages to historic properties from varying amounts of sea-level rise and storms of various intensities as well as evaluate the relative benefits and costs of adaptive response strategies.

Sea-Level Rise Vulnerability Tools and Local Planning Efforts Comparison Crosswalk[3]

The following crosswalk identifies how each sea-level rise vulnerability tool inventoried in the *Sea-Level Rise Vulnerability Assessment Tools and Resources* guidebook can support specific aspects of the eight local planning efforts previously described in this document. The general process used to determine if a tool was a "match" or "no match" included reviewing the description of each tool as well as the examples of when and where to use the tool found in the one page profiles in Appendix A of the guidebook. If the tool outputs can directly support and enhance a given local planning effort, the tool was considered a "match." This includes producing outputs that can be used during different stages of the planning process which are unique to each individual planning effort (e.g., visuals to facilitate public engagement, data to inform the planning context, identification of vulnerable assets, estimates of potential impacts to community assets, and effectiveness of potential adaptive strategies).

[2] http://www.nps.gov/nr/publications/bulletins/nrb16a/nrb16a_II.htm

[3] Note: This crosswalk identifies the local planning efforts into which each tool can be incorporated based on the most common applications of each tool. Keep in mind that if a planning effort is not checked, it does not necessarily exclude the tool from being utilized during that planning effort.

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
Visualization Tools								
CanVis	✔ **Facilitate public engagement** using visuals that simulate the potential impacts of rising waters on local landmarks **Inform future land uses** by simulating potential impacts of rising waters on structures located in vulnerable areas	✔ **Facilitate public engagement** using visuals that simulate the potential impacts of rising waters on local landmarks **Inform hazard risk assessment** to assist in visualization of future conditions **Support mitigation strategies** that address sea-level rise	✘	✘	✘	✔ **Demonstrate impact of sea-level rise to infrastructure** by simulating the potential impacts of rising waters on infrastructure located in vulnerable areas	✘	✔ **Demonstrate impact of sea-level rise to historic structures** by simulating the potential impacts of rising waters on historic structures located in vulnerable areas **Support historic preservation zoning and land development designations** in non-vulnerable areas

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	✓	✓	✓	✓	✓	✓	✓	✓
Climate Central's Surging Seas	**Inform planning context** by identifying populations, infrastructure, and assets that are exposed to coastal flooding aggravated by sea-level rise **Facilitate public engagement and build awareness** by illustrating sea-level rise scenarios and showing what land will potentially be inundated by water **Inform future land uses** by limiting development in areas which are identified as vulnerable to potential impacts from sea-level rise **Inform plan goals and policies** based on community risk	**Facilitate public engagement and build awareness** by illustrating sea-level rise scenarios and showing what land will potentially be inundated by water **Inform hazard risk assessment** by demonstrating how a community may be vulnerable to future sea-level rise and describing impact statistics such as the percentage of population that would be impacted **Support mitigation strategies** based on vulnerable areas and potential impacts identified	**Inform management area boundaries** by depicting areas in a community that would be inundated by water under different sea-level rise scenarios and including these areas in natural resource protection areas to reduce the impact on people and property	**Identify infrastructure and assets that are vulnerable** to various sea-level rise scenarios **Inform infrastructure investment and reinvestment priorities** to ensure assets are located outside of identified inundation areas **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas **Identify impacts to major employers and industries** from potential sea-level rise such as distribution area disruption and transportation route damage	**Develop and/or inform applicable policies** that require post-disaster development and redevelopment to be located outside of areas that may be inundated by water under different sea-level rise scenarios in order to promote disaster-resilient development	**Identify infrastructure and assets** that are vulnerable to various sea-level rise scenarios **Inform infrastructure investment and reinvestment priorities** to locate infrastructure outside of identified inundation areas and incentivize less vulnerable growth areas	**Develop policies for stormwater management infrastructure** that require any infrastructure built within potential inundation areas to be able to function under projected rises in sea level	**Identify vulnerable historic structures, neighborhoods, and/or districts** located in areas which may be inundated by water under various sea-level rise scenarios

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FDOT Sea Level Scenario Sketch Planning Tool	✓ **Inform future land** uses by encouraging development outside of areas that can be potentially inundated by sea-level rise and limiting infrastructure investments within those areas **Inform plan goals and policies** by providing information on community risk and vulnerability to future sea-level rise **Visualize potential future conditions** and guide development away from potential inundation areas **Identify vulnerable transportation infrastructure** that is located within areas potentially inundated by sea-level rise	✓ **Conduct preliminary assessment of transportation** infrastructure to identify existing infrastructure **Identify vulnerable transportation infrastructure** by visualizing areas that can be potentially inundated by sea-level rise **Prioritize mitigation strategies** for retrofitting and/or relocating facilities potentially at risk from sea-level rise inundation	✓ **Inform management area boundaries** by illustrating areas in a community that would be inundated by water under different sea-level rise scenarios and including these areas in natural resource protection areas to reduce the impact on people and property	✓ **Identify vulnerable transportation infrastructure** and prioritize the retrofit or relocation of facilities potentially at risk **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas vulnerable to sea-level rise	✓ **Inform policies for post-disaster redevelopment** that require infrastructure built or rebuilt within vulnerable areas to be able to function under projected rises in sea level	✓ **Identify vulnerable transportation infrastructure** and prioritize the retrofit or relocation of facilities potentially at risk **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas vulnerable to sea-level rise	✓ **Develop policies for stormwater management infrastructure** that require any infrastructure built within potential inundation areas to be able to function under projected rises in sea level	✓ **Identify at-risk historic structures** by downloading the data features available and mapping historic properties in relation to sea-level rise inundation areas

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The Nature Conservancy Coastal Resilience Mapping Portal	✓ **Understand planning context** and future conditions to guide future development away from areas vulnerable to future sea-level rise scenarios **Inform plan goals and policies** by providing information on community risk **Guide open space planning** by identifying locations vulnerable to future sea-level rise that should be used as open space	✓ **Inform hazard risk assessment** by illustrating different magnitudes and extents of sea-level rise under different model-based projections **Explore how sea-level rise might degrade habitats** and create policies to promote habitat protection	✓ **Inform management area boundaries** by identifying areas with high exposure and vulnerability to sea-level rise and choosing boundaries that include impacted areas in natural resource protection areas to reduce the impact on people and property	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas vulnerable to future sea-level rise scenarios **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas **Identify impacts to major employers and industries** under potential sea-level rise scenarios such as distribution area disruption and transportation route damage	✓ **Identify locations for redevelopment,** outside of areas impacted under alterative sea-level scenarios **Develop policies for post-disaster development and redevelopment** that require development and redevelopment to be located outside of areas at risk to future sea-level rise	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas vulnerable to future sea-level rise scenarios **Incentivize less vulnerable growth areas** that are outside of areas vulnerable to future sea-level rise scenarios	✓ **Develop policies for stormwater management infrastructure** that require any infrastructure built within potential inundation areas to be able to function under projected rises in sea level	✓ **Identify vulnerable historic structures, neighborhoods, and/or districts** which are located in areas vulnerable to sea-level rise scenarios

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	✓	✓	✓	✗	✗	✗	✓	✗
NOAA Coastal Change Analysis Program (C-CAP) Land Cover Atlas and Coastal Comparison Tool	**Understand planning context** by assessing existing land cover and general land use change trends **Identify land use trends** in community and guide development away from vulnerable areas	**Understand planning context** by assessing existing land cover and general land use change trends **Indicate changes of interest**, such as marsh losses to open water, and identify solutions	**Determine which natural resource areas may be vulnerable** to loss and identify policies to protect them **Inform management policy priorities** giving the highest priority to areas which have undergone land use changes and may be vulnerable to loss				**Inform policies for stormwater management infrastructure design** based on land use change trends over time **Guide stormwater facility construction** to areas that are not projected to be at risk to sea-level rise	

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
NOAA Sea-Level Rise and Coastal Flooding Impacts Viewer	✓ **Understand planning context** by identifying specific vulnerable areas **Facilitate public engagement and build awareness** through visual demonstration of potential impacts from different increments of sea-level rise **Inform future land uses** and guide permitting for land uses in vulnerable areas **Inform plan goals and policies** by targeting areas which are at higher risk to various increments of potential sea-level rise	✓ **Facilitate public engagement and build awareness** by displaying sea-level rise in one foot increments from 1 to 6 feet showing which areas may be inundated and by how much **Inform hazard risk assessment** by identifying where the most vulnerable areas are located as well as potential sea level elevations **Identify local landmarks that could be impacted** by sea-level rise	✓ **Inform management area boundaries** by identifying areas which are most vulnerable, include magnitude of severity based on predicted sea-level rise increments, and choosing boundaries that include vulnerable areas in natural resource protection areas to reduce the impact on people and property	✓ **Inform infrastructure investment and reinvestment priorities** to target at-risk structures located in potential inundation areas **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas **Relocate economic resources and assets** outside of the potential inundation areas	✓ **Inform policies for post-disaster development and redevelopment** to ensure development and redevelopment are located outside potential inundation areas	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of potential inundation areas **Incentivize less vulnerable growth areas** that are outside of potential inundation areas	✓ **Develop policies for stormwater management infrastructure** that require any infrastructure built within potential inundation areas to be able to function under projected rises in sea level	✓ **Identify vulnerable historic structures, neighborhoods, and/or districts** which are located in areas that are vulnerable under various sea-level rise scenarios
NOAA Sea Level Trends	✓ **Understand planning context** by assessing regional trends in sea level, including direction and magnitude of change, to guide future development	✓ **Inform hazard risk assessment** by describing the historic changes in sea level	✗	✗	✗	✗	✗	✗

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Social Vulnerability Index (SoVI)	✓ **Understand planning context** and geographic variation in social vulnerability by determining which census tract have lower capacity for preparedness and response **Illustrate geographic variations in social vulnerability** to environmental hazards **Inform plan goals and policies** by providing information on the levels of social vulnerability across a community	✓ **Inform vulnerability assessment** by assessing which census tracts have lower preparedness and response and therefore are at greater risk **Prioritize mitigation strategies** by identifying which census tracts have the lowest capacity for preparedness and response and therefore have the greatest need for resources to reduce pre-existing vulnerability	✗	✗	✗	✗	✗	✗

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	✓	✓	✓	✗	✓	✓	✗	✗
USGS National Assessment of Coastal Vulnerability to Sea-Level Rise: Coastal Vulnerability Index (CVI)	**Understand planning context** and assess/ illustrate coastal vulnerability to physical changes and erosion **Inform natural resource element of the plan** by identifying which coastlines are most vulnerable to physical changes due to sea-level rise; this can inform overlay area or conservation area boundaries **Inform plan goals and policies** by providing information on the risk to which a community's coast is vulnerable	**Inform hazard risk assessment** by demonstrating which sections of a community's shorelines are most vulnerable to future sea-level rise **Inform mitigation strategy priorities** by identifying which sections of a community's shoreline have the highest vulnerability to physical change and erosion and therefore have the greatest need for protection or restoration	**Inform management area boundaries** by identifying which areas are most vulnerable to physical changes and including shorelines with high vulnerability in natural resource protection areas to limit future erosion		**Inform post-disaster restoration project priorities** to ensure development and redevelopment are located outside of coastline areas that are most vulnerable to physical change and erosion	**Inform project priorities** to ensure armoring or coastal protection project and infrastructure investments protect the most vulnerable coastlines		

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	✓	✓	✓	✗	✓	✓	✗	✗
USGS Digital Shoreline Analysis System (DSAS)	**Understand planning context** and assess rates of erosion and accretion **Inform natural resource element of the plan** by identifying which areas of a community's shoreline are undergoing the highest rates of erosion and may be most vulnerable to sea-level rise; this can inform overlay area or conservation area boundaries **Inform plan goals and policies** by illustrating shoreline changes and providing information on the risk to which a community's coast is vulnerable	**Inform hazard risk assessment** by illustrating the historic rates of erosion and accretion along a community's shorelines **Inform mitigation strategy priorities** by identifying which sections of a community's shoreline have experienced the highest rates of erosion and therefore have the greatest need for protection or restoration	**Inform management area boundaries** by identifying which sections of a community's shoreline have undergone the greatest amount of erosion and including those sections in natural resource protection areas to limit future erosion		**Inform post-disaster restoration project priorities** to ensure development and redevelopment are located outside of shoreline areas that have undergone the highest rates of change and are most vulnerable to erosion	**Inform project priorities** to ensure armoring or coastal protection project and infrastructure investments protect the most vulnerable coastlines		

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
Modeling Tools								
ADvanced CIRCulation Model (ADCIRC)	✓ **Inform future land uses** by limiting development in areas which are identified as being vulnerable to storm surge **Inform plan goals and policies** by providing information on the risk to which a community is vulnerable	✓ **Inform hazard risk assessment** by identifying areas that would be inundated by storm surge under future sea-level rise scenarios **Inform hazard risk assessment** by modeling future tide and storm surge elevations and velocities	✓ **Inform management area boundaries** by identifying areas in a community that would be inundated by storm surge and including those areas in natural resource protection areas to reduce impact on people and property	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of the identified inundation areas **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas **Relocate resources and assets** outside of the identified inundation areas	✓ **Inform policies for post-disaster development and redevelopment** to ensure development and redevelopment are located outside of areas that are vulnerable to storm surge under future sea-level rise scenarios	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of the identified inundation areas **Incentivize less vulnerable growth areas** that are outside of potential inundation areas	✓ **Develop policies for stormwater management infrastructure** that require any infrastructure built within potential inundation areas to be able to function under projected storm surge impacts	✓ **Identify vulnerable historic structures, neighborhoods, and/or districts** which are located in areas vulnerable to storm surge under future sea-level rise scenarios

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Hazus-MH	✓ **Inform plan goals and policies** by providing information on the risk to which a community is vulnerable **Determine potential losses** that could be experienced due to future sea-level rise	✓ **Inform vulnerability assessment** by estimating potential losses due to sea-level rise **Prioritize mitigation strategies** based on potential loss estimates	✗	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of the identified vulnerable areas **Identify impacts to major employers and industries** from future sea-level rise such as distribution area disruption and transportation route damage	✓ **Inform policies for post-disaster development and redevelopment** to ensure development occurs outside of areas vulnerable to future sea-level rise and storm surge	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas vulnerable to sea-level rise	✓ **Develop policies for stormwater management infrastructure** that require any infrastructure built within areas vulnerable to sea-level rise be able to function under projected storm surge impacts	✓ **Estimate potential damage to historic structures** due to sea-level rise; however, results for an individual building must considered an average for a group of similar buildings

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	✓	✓	✓	✓	✗	✗	✗	✗
Integrated Valuation of Environmental Services and Tradeoffs (InVEST)	**Understand planning context** and assess ecosystem and coastal vulnerability due to the impacts of erosion and inundation under projected sea-level rise **Inform natural resource element of the plan** by identifying which ecosystem services are vulnerable to sea-level rise; this can inform overlay area or conservation area boundaries **Inform comprehensive plan goals and polices** by providing information on which ecosystems and areas of a community's shoreline are most susceptible to sea-level rise	**Inform hazard risk assessment** by demonstrating which areas of a community are most vulnerable to future sea-level rise **Inform mitigation strategy priorities** by identifying which ecosystems in a community have the highest vulnerability to sea-level rise and therefore greatest need for protection	**Inform management area boundaries** by identifying ecosystems with high vulnerability to sea-level rise and including those areas in natural resource protection areas to limit future impacts	**Inform development decisions** by displaying how coastal resources will be enhanced or degraded under different management and climate scenarios **Inform development standards** within vulnerable areas to protect current ecosystem assets				

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NatureServe Climate Change Vulnerability Index (CCVI)	✓ **Understand planning context** and assess plant and animal species vulnerability to impacts of erosion and inundation from projected sea-level rise **Inform natural resource element of the plan** by identifying species most likely to be impacted by sea-level rise; this can inform overlay area or conservation area boundaries **Inform comprehensive plan goals and policies** by providing information on the risk to which species are vulnerable due to future sea-level rise	✓ **Inform hazard risk assessment** by demonstrating which plant and animal species are most vulnerable to future sea-level rise **Inform mitigation strategy priorities** by identifying which species have the highest vulnerability to sea-level rise and therefore have the greatest need for protection	✓ **Inform management area boundaries** by identifying which plant and animal species are most vulnerable to sea-level rise and including species within high vulnerability in natural resource protection areas to limit future impacts	✗	✗	✗	✗	✗

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	✓	✓	✓	✓	✓	✓	✓	✓
NOAA Wave Exposure Model (WEMo)	**Inform future land uses** by limiting development in areas which may be affected by wave exposure under future sea-level rise scenarios **Inform natural resource element of the plan** by estimating wave energy and its effects on ecosystem functions; this can inform overlay area or conservation area boundaries **Inform comprehensive plan goals and policies** by providing information on risk from wave exposure	**Inform hazard risk assessment** by identifying areas in a community that may be affected by wave exposure under future sea-level rise **Estimate potential impacts** on ecosystem functions and developed coastal areas	**Inform management area boundary changes** by estimating wave energy and its effects on ecosystem functions and natural areas and including areas affected by wave energy in natural resource protection areas to reduce impact on people and property	**Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas which may be affected by wave exposure **Identify and incentivize** a **less vulnerable growth center** to guide investments or reinvestments to areas with low wave exposure	**Inform policies for post-disaster development and redevelopment** to ensure development occurs outsides of areas that are vulnerable to wave exposure	**Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of areas that are vulnerable to wave exposure **Incentivize less vulnerable growth areas** that are outside of potential wave exposure areas	**Develop policies for stormwater management infrastructure** that require any infrastructure built within areas vulnerable to wave exposure be able to function under projected exposure impacts	**Identify vulnerable historic structures, neighborhoods, and/or districts** that may be affected by wave exposure under future sea-level rise scenarios

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
	✓	✓	✓	✗	✓	✓	✓	✗
Sea Levels Affecting Marshes Model (SLAMM)	**Inform natural resource element of the plan** by identifying coastal areas vulnerable to wetland conversion and shoreline modification resulting from long-term sea-level rise **Inform comprehensive plan goals and policies** by providing information on coastal vulnerability due to future sea-level rise	**Inform hazard risk assessment** by identifying which coastal areas are most vulnerable to wetland conversion and modification resulting from long-term sea-level rise **Inform mitigation strategy priorities** by identifying which coastal areas are most vulnerable to conservation and modification resulting from long-term sea-level rise and therefore have the greatest need for protection or restoration	**Inform management area boundaries** by identifying which coastal areas are most vulnerable to wetland conversion and shoreline modification resulting from long-term sea-level rise and including vulnerable areas in natural resource protection areas to limit future conversion and erosion		**Inform post-disaster restoration project priorities** to ensure the coastal areas most vulnerable to wetland conversion and shoreline modification resulting from long-term sea-level rise are restored	**Inform project priorities** to ensure armoring or coastal protection project and infrastructure investments protect the most vulnerable wetlands and shorelines	**Develop policies for stormwater management infrastructure** that require any infrastructure built within coastal areas vulnerable to conversion and erosion be able to function under projected impacts from sea-level rise	

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Simulator of Climate Change Risks and Adaptation Initiatives (SimCLIM)	✓ **Inform future land uses** by limiting development in areas that may potentially be inundated by sea-level rise **Inform natural resource element of the plan** by simulating shoreline changes for beach and dune systems and identifying which areas most sensitive to sea-level rise **Inform comprehensive plan goals and policies** by providing information on which areas most sensitive to sea-level rise	✓ **Inform hazard risk assessment** by modeling projected impacts of sea-level rise; this can identify areas of potential inundation as well as simulate shoreline changes for beach and dune systems **Inform mitigation strategy priorities** by identifying which beach and dune systems in a community are most sensitive to sea-level rise and therefore have the greatest need for protection	✓ **Inform management area boundaries** by identifying which beach and dune systems are most sensitive to sea-level rise and including those systems in natural resource protection areas to limit future impacts	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of potential inundation areas **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas	✓ **Inform post-disaster restoration project priorities** to ensure development occurs outside of potential inundation areas	✓ **Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of potential inundation areas **Incentivize less vulnerable growth areas** that are outside of potential inundation areas	✓ **Analyze storm sewer capacity issues, identify problem areas, and develop and prioritize solutions** by evaluating the cost and risk of different mitigation scenarios and different assumptions for sea-level rise	✓ **Identify vulnerable historic structures, neighborhoods, and/or districts** which are located in areas that may potentially be inundated by sea-level rise
USACE Sea Level Change Curve Calculator	✓ **Inform comprehensive plan goals and policies** by providing information on risk due to predicted future sea-level rise	✓ **Inform hazard risk assessment** by providing the predicted amount of sea level change for locations along the coast from 1992 forward	✗	✗	✗	✗	✗	✗

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Decision Support Tools								
Beach-*fx*	✗	✓ **Inform mitigation strategy priorities** by evaluating physical performance and economic benefits and costs of shore protection projects	✗	✗	✓ **Inform post-disaster project priorities** by evaluating the physical performance and economic benefits and costs of shore protection projects	✓ **Inform project priorities** by evaluating the physical performance and economic benefits and costs of shore protection projects	✗	✗

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
	✓	✓	✗	✗	✓	✓	✗	✓
Coastal Adaptation to Sea-Level Rise Tool (COAST)	**Understand planning context** and assess vulnerable assets by visualizing damages under a specific sea-level rise scenario and storm event if no adaption actions are taken **Facilitate public engagement** by empowering stakeholders to compare multiple future scenarios, select expectations of future conditions, and visualize damages under action versus no-action scenarios **Inform land use planning** by helping to evaluate the relative benefits and costs of sea-level rise response strategies **Inform comprehensive plan goals and policies** by providing information on vulnerability due to future sea-level rise	**Facilitate public engagement** by empowering stakeholders to compare multiple future scenarios, select expectations of future conditions, and visualize damages under action versus no-action scenarios **Inform hazard risk assessment** by predicting the damages from varying amounts of sea-level rise and storms of various intensities **Inform mitigation strategy priorities** by evaluating the relative benefits and costs of adaptive response strategies to avoid damages to assets from sea-level rise			**Inform post-disaster project priorities** by evaluating the relative benefits and costs of adaptive response strategies to avoid damages to assets from sea-level rise	**Inform project priorities** by evaluating the relative benefits and costs of adaptive response strategies to avoid damages to assets from sea-level rise		**Inform project priorities** by predicting damages from varying amounts of sea-level rise and evaluating the relative benefits and costs of adaptive response strategies to avoid damages to historic structures

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CommunityViz	✔	✔	✔	✔	✔	✔	✘	✘
	Understand planning context and risk using 2D and 3D models that show implications of various planning decisions and scenarios **Facilitate public engagement** by visualizing and communicating possible future land use change scenarios driven by sea-level rise **Inform future land uses** by bringing to light possible future scenarios driven by sea-level rise and showing the implications of various planning decisions and scenarios **Inform comprehensive plan goals and policies** by providing information on sea-level rise vulnerability and the impacts of proposed changes	**Facilitate public engagement** by visualizing and communicating possible future land use change scenarios driven by sea-level rise **Inform hazard risk assessment** by helping to conduct risk and impact assessments such as counting buildings affected by potential floods or storm surge **Inform mitigation strategy priorities** by helping to analyze the impacts of potential planning and mitigation alternatives	**Inform management area boundaries** by analyzing potential adaptation strategies, such as implementing conservation or natural resource protection policies, that may help limit future impacts of sea-level rise	**Inform infrastructure investment or reinvestment and economic redevelopment initiative priorities** driven by future sea-level rise by analyzing how various transportation system improvements and development patterns could impact the community	**Inform post-disaster development and redevelopment** by analyzing how future land use changes and sustainable development patterns could impact the community	**Inform infrastructure investments or reinvestments** driven by future sea-level rise by analyzing how various transportation system improvements could impact the community		

NatureServe Vista	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
	✓	✓	✓	✗	✓	✗	✗	✗
	Understand planning context by evaluating ecological, urban, and agricultural resources under current conditions and assessing impacts under various sea-level rise scenarios **Inform land use planning** by assessing impacts to ecological, urban, and agricultural resources from various sea-level rise scenarios and showing which developed areas are potentially at risk **Inform comprehensive plan goals and policies** by providing information on vulnerability to future sea-level rise as well as potential mitigation and adaptation options that best achieve planning objectives	**Inform hazard risk assessment** by showing what resources and developed areas are potentially at risk to sea-level rise **Inform mitigation strategy priorities** by helping to demonstrate the impact of mitigation and sea-level rise adaptation strategies and determine which alternatives best achieve planning objectives	**Inform management area boundaries** by evaluating ecological and agricultural resources under current conditions, assessing the impacts to those resources under various sea-level rise scenarios, and analyzing resource management scenarios		**Inform post-disaster conservation efforts** by evaluating ecological, urban, and agricultural resources and analyzing various land use and resource management scenarios			

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NOAA Inundation Analysis Tool	✓ **Understand planning context** by determining the frequency and duration of observed high tides and creating scenarios of expected conditions given sea-level rise **Inform land use planning** by coupling historical high-water data with long-term sea-level trends **Inform comprehensive plan goals and policies** by providing information on risk and vulnerability based on scenarios of increased sea-level rise	✓ **Inform hazard risk assessment** by determining the historical frequency and duration of observed high tides at NOAA tide gauge stations; historical high-water data can also be coupled with long-term sea level trends to create scenarios of increased sea-level rise	✗	✗	✗	✗	✗	✗

	Local Comprehensive Plan	Local Mitigation Strategy	Special Area Management Plan	Economic Development Plan	Post-Disaster Redevelopment Plan	Capital Improvements Plan	Stormwater Management Plan	Historic Preservation Plan
U.S. DOT Vulnerability Assessment Scoring Tool (VAST)	✓	✓	✗	✓	✗	✓	✗	✗
	Understand planning context by identifying transportation systems that may be vulnerable to sea-level rise **Inform transportation element of the plan** by identifying which components of the transportation system may be vulnerable to sea-level rise; this can be used to prioritize retrofits for the most vulnerable infrastructure **Inform comprehensive plan goals and policies** by providing information on infrastructure vulnerable to future sea-level rise	**Inform vulnerability assessment** by identifying the components of the transportation system that are most vulnerable to impacts from sea-level rise **Inform mitigation strategy priorities** by identifying the components of the transportation system that are most vulnerable to impacts from sea-level rise and therefore have the greatest need for upgrades and retrofits to lessen potential damage		**Inform infrastructure investment or reinvestment priorities** by identifying the components of the transportation system that are most vulnerable to impacts from sea-level rise and therefore have the greatest need for upgrades and retrofits to lessen potential damage		**Inform infrastructure investment or reinvestment priorities** by identifying the components of the transportation system that are most vulnerable to impacts from sea-level rise and therefore have the greatest need for upgrades and retrofits to lessen potential damage		

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Databases of Resources								
Adaptation Database for Planning Tool (ADAPT)	✓ **Inform planning process** by guiding local government users through a 5-step adaptation planning process **Inform comprehensive plan goals and policies** by helping conduct a vulnerability assessment, set preparedness goals, and develop a climate preparedness plan	✓ **Inform planning process** by using 5-step planning assessment to determine risk **Inform hazard risk assessment** by conducting a climate resiliency study or vulnerability assessment **Inform mitigation goals and strategies** by setting preparedness goals and developing a climate preparedness plan	✗	✗	✓ **Inform planning process** by using a 5-step adaption planning process **Inform preparedness goals** by developing a climate preparedness plan	✗	✗	✗

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Climate Adaptation Knowledge Exchange (CAKE)	✓ **Inform planning process** by providing information on adaptation and adaptation planning	✓ **Inform planning process** by providing information on adaptation and adaptation planning **Inform hazard risk assessment** by providing a database of tools that can be used to help conduct risk and vulnerability assessments	✗	✗	✓ **Inform planning process** by providing information on adaptation and adaptation planning	✗	✗	✓ **Guide preservation efforts** by providing information about vulnerability in the historic context as well as opportunities to connect with other communities that are undertaking historic property sea-level rise assessment
Ecosystem-Based Management (EBM) Tools Network and Database	✓ **Inform planning process** by providing information on inter-disciplinary coastal-marine spatial planning and ecosystem-based management that can help improve decision making	✓ **Inform planning process** by providing information on inter-disciplinary coastal-marine spatial planning and ecosystem-based management **Inform hazard risk assessment** by providing a database of tools that can be used to help conduct risk and vulnerability assessments	✓ **Inform planning efforts** by providing information on inter-disciplinary coastal-marine spatial planning and ecosystem-based management	✗	✓ **Inform planning efforts** by providing information on inter-disciplinary coastal-marine spatial planning and ecosystem-based management	✗	✗	✗

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FL DEP Map Direct Gateway	✓ **Understand planning context** by providing information and access to a large number of DEP data layers that are relevant to sea-level rise adaptation	✓ **Understand planning context** by providing information and access to a large number of DEP data layers that are relevant to sea-level rise adaptation	✓ **Inform planning efforts** by providing information and access to a large number of DEP data layers that are relevant to sea-level rise adaptation	✗	✓ **Inform planning efforts** by providing information and access to a large number of DEP data layers that are relevant to sea-level rise adaptation	✗	✗	✗

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	✓	✓	✓	✗	✓	✗	✗	✗
Florida Natural Areas Inventory (FNAI)	**Understand planning context** by providing information and data on land cover, critical lands and waters, and land acquisitions **Inform natural resource element of the plan** by providing information and data on natural coastal land cover; this can inform overlay area or conservation area boundaries to protect lands and waters that are critical to conservation of natural resources **Inform natural resource element of the plan** by providing information on boundaries of environmental land acquisition projects; this can help identify possible acquisitions adjacent to existing protected properties	**Inform hazard risk assessment** by providing information and data on land cover and critical lands and waters **Inform mitigation strategy priorities** by providing information on the boundaries of environmental land acquisition projects and helping identify possible acquisitions adjacent to existing protected properties	**Inform management area boundaries** by providing information and data on land cover, critical lands and waters, and land acquisitions		**Inform post-disaster conservation efforts** by providing information on which critical lands and waters are most at risk to potential impacts from sea-level rise			

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Georgetown Climate Center	✓	✓	✓	✗	✓	✗	✓	✗
	Inform land use planning by providing information on 18 different land use tools that can be used to pre-emptively respond to threats to public and private coastal development and infrastructure posed by sea-level rise **Inform comprehensive plan policies** by helping to determine which tools to employ to make a community better prepared to cope with threats posed by rising sea levels and higher storm surges	**Inform mitigation strategy priorities** by providing information on 18 different land use tools that can be used to pre-emptively respond to threats to public and private coastal development and infrastructure posed by sea-level rise	**Guide preservation efforts** by providing information that can be used to help compose policies		**Inform post-disaster development and redevelopment efforts** by providing information on 18 different land use tools that can be used to pre-emptively respond to threats to public and private coastal development and infrastructure posed by sea-level rise		**Inform stormwater management policies and regulations** by providing information that can be used to help compose policies	

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Geospatial Assessment Tool for Operations and Response (GATOR)	✓ **Understand planning context** by providing demographic, infrastructure, economic, and environmental data **Inform comprehensive plan goals and policies** by providing information on a community's vulnerability, including storm surge zones, storm surge depth, hurricane evacuation zones, and social vulnerability	✓ **Inform hazard risk assessment** by providing demographic, infrastructure, economic, and environmental data as well as information on a community's vulnerability, including storm surge zones, storm surge depth, hurricane evacuation zones, and social vulnerability	✗	✓ **Understand planning context** by providing infrastructure and economic data	✓ **Provide information on existing conditions** by identifying the locations of critical infrastructure **Assist in the emergency warnings** for hurricanes and other storm-surge events	✓ **Understand planning process** by providing infrastructure data	✗	✗

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	✓	✓	✓	✓	✓	✓	✓	✓
U.S. Climate Resilience Toolkit	**Inform planning process** by offering resources to help address sea-level rise **Inform planning context** by helping to estimate and examine the current and/or potential impacts **Inform future land uses** by limiting development in areas which are identified as vulnerable to potential impacts from sea-level rise **Inform comprehensive plan goals and policies** by providing information on vulnerability due to future sea-level rise	**Inform planning process** by offering resources to help address sea-level rise **Inform hazard risk assessment** by identifying areas that may be vulnerable to future sea-level rise and estimating potential impacts through the use of multiple tools that can be used to estimate, simulate, visualize, and monitor sea-level rise and its impacts	**Inform management area boundaries** by depicting areas that would be inundated by water under different sea-level rise scenarios and including potentially impacted areas in natural resource protection areas to reduce the impact on people and property	**Inform infrastructure investment and reinvestment priorities and relocation of economic resources** to ensure assets are located outside of identified inundation areas **Identify and incentivize a less vulnerable growth center** to guide investments or reinvestments to non-vulnerable areas	**Inform planning process** by offering examples of communities that have taken action to reduce their vulnerability **Inform policies for post-disaster development and redevelopment** to ensure assets are located outside of identified inundation areas to promote disaster-resilient development	**Inform infrastructure investment and reinvestment priorities** to ensure infrastructure is located outside of potential inundation areas **Identify and incentivize less vulnerable growth areas** to guide investments or reinvestments to non-vulnerable areas	**Develop policies for stormwater management infrastructure** that require any infrastructure built within inundation areas to be able to function under projected rises in sea level	**Identify vulnerable historic structures, neighborhoods, and/or districts** which are located in areas that may potentially be inundated by sea-level rise

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weADAPT	✓ **Inform planning process** by providing information and data results related to sea-level rise and its impacts, including experience, tools, case studies, and other information	✓ **Inform planning process** by providing information and data results related to sea-level rise and its impacts, including experience, tools, case studies, and other information	✗	✗	✓ **Inform planning process** by providing information and data results related to sea-level rise and its impacts, including experience, tools, case studies, and other information	✗	✗	✗