Florida Community Resiliency Initiative Pilot Project

Adaptation Plan

for St. Augustine, Florida

May 2017

This publication was funded in part, through a grant agreement from the Florida Department of Environmental Protection, Florida Coastal Management Program, by a grant provided by the Office for Coastal Management under the Coastal Zone Management Act of 1972, as amended, National Oceanic and Atmospheric Administration Award No. NA15NOS4190217. The views, statements, findings, conclusions and recommendations expressed herein are those of the author(s) and do not necessarily reflect the views of the State of Florida, NOAA or any of their sub-agencies.

EXECUTIVE SUMMARY

Florida communities like St. Augustine are already experiencing the adverse impacts of rising seas, more intense storms, and heavier downpours. The Florida Department of Economic Opportunity's Coastal Resiliency Initiative helps communities assess vulnerabilities to projected increases in coastal flooding and develop strategies to make affected areas more resilient.

This report is intended to complement Dewberry's Vulnerability Assessment and to provide St. Augustine with a law and policy framework for pursuing coastal resiliency. The Vulnerability Assessment draws on data from federal agencies and on inputs from St. Augustine officials and community members in order to characterize the nature, implications, and certainty of the most important ways in which St. Augustine is vulnerable to the impacts of sea level rise (SLR) and changing weather patterns. At the City's request, the present document identifies relevant legal and policy-making tools available that might serve to effectuate appropriate responses to those vulnerabilities. It also identifies legal, political, economic, and other limits on St. Augustine's potential resiliency initiatives.

Information contained in the Adaptation Plan

Reference material. On October 17, 2016 the Sabin Center for Climate Change Law, Dewberry and state and local partners convened a Preliminary Workshop to introduce and discuss development of a Strategic Resiliency Plan. Some of the information covered in this document may be familiar to participants in that workshop, but has been included to provide a resource that officials and others can draw on as a reference point. For instance, the Preliminary Workshop introduced the Protection-Accommodation-Retreat adaptation rubric and a number of land use policy tools (including setbacks, transferrable development rights and conservation easements) suitable for coastal localities that want to adapt themselves to rising seas. However, many residents of St. Augustine and at least some political representatives are likely unfamiliar with this material. Accordingly, we have referenced herein a robust universe of material, including material relevant to prioritizing particular resiliency measures. So that users of this report can get easy access to the documents referenced in its footnotes, including those that might sit behind paywalls, those documents have been stored using permanent internet hyperlinks.

Summaries of key vulnerabilities. Dewberry's Vulnerability Assessment provides an accessible, authoritative snapshot of the challenges facing St. Augustine now and in the foreseeable future. This document's short summaries of key vulnerabilities draw on that Assessment and on comments made during the Preliminary Workshop. Readers can refer the adaptation measures discussed in section 4 of this document directly to Dewberry's Assessment, but section 2's summaries make internal cross references available as well.

Critical circumstances unique to St. Augustine. Discussion at the Preliminary Workshop brought to light aspects of St. Augustine's situation that are critically important to prospective

adaptation efforts. The most salient of these features, which section 3 discusses at greater length, are as follows:

- St. Augustine's historic districts are vulnerable, immovable, and irreplaceable;
- Foreseeable SLR conditions are at odds with state-determined design parameters for local roads and bridges;
- Despite dire SLR predictions, routine nuisance flooding, and the recent experience of storm surge with Hurricane Matthew, the revised Flood Insurance Rate Maps (FIRMs) proposed by the Federal Emergency Management Agency (FEMA) would not change the City's designate floodplain or base flood elevations (BFEs);
- Many residents seem not to know what's coming.

Potential responses to key vulnerabilities. Much of this document describes important parts of the context in which adaptation efforts would occur. Section 4 discusses adaptation measures that could serve adaptation efforts in St. Augustine.

Legal reference material. This document does not contain legal advice for St. Augustine. Its descriptions of legal issues (located in Appendix A) such as sovereign immunity and takings law do not tell a lawyer for the City everything they would need to know in order to anticipate the legal implications of a particular policy agenda. Descriptions of legal issues instead provide a summary—for lawyers and non-lawyers—of how the law might push, tether, or prohibit particular parties in relation to various rights and obligations implicated in actions intended to better adapt to changing environmental circumstances.

Suggestions for Adaptation in St. Augustine

The following list summarizes proposals set forth in this report and notes the section(s) that discuss a particular proposal more fully. The first two proposals are overarching and meant to inform the way not just one but multiple adaptation measures are developed and implemented. The remaining proposals focus on policy tools or vehicles that can be applied to various vulnerabilities and on particular problems or decisions facing the City.

The two overarching proposals are as follows:

- *Educate the public, and business- and property-owners in particular, about what SLR impacts and policy responses to expect in the foreseeable future*
  This suggestion appears in multiple places throughout this document because no single adaptation agenda item is more important for St. Augustine than conveying to stakeholders how rising seas and changing weather are expected to affect the City. In many instances, this education will occur by requiring private parties to give or take notice of known risks, for instance by requiring disclosure in real estate transactions of

the frequency and height of all types of flooding that affect the property, or by a survey of the capacity and state of repair of existing coastal armoring. In other instances, it might accompany revisions to the Future Land Use comprehensive plan element or announced changes to infrastructure location or capacity. Sections 3 and 4, and Appendix A, discuss various approaches to informing stakeholders about risks and responses.

- *Develop baselines so that budgets reflect expected future costs*
  Preliminary Workshop participants made clear that the City's current approach to budgeting does not capture in an easily discernible fashion the costs imposed by nuisance flooding or other SLR-driven impacts. Discerning what it costs the City to deal with such impacts could greatly improve St. Augustine's ability to anticipate future costs, which in turn will help inform when to consider planning, land use, or design changes because "business as usual" is likely to become prohibitively expensive. Sections 4.1 (Priority-Setting), 4.3.2 (Stormwater and wastewater management), 4.3.3 (Roads and bridges), and A.2.2 (Takings) discuss different ways to apply this suggestion.

Section 4.2 discusses the following three types of policy vehicles:

- *Pre-disaster planning for post-disaster policy changes (section 4.2.1)*
  Disasters highlight topography, systems, and structures that are vulnerable. Thus, in addition to causing damage, disasters also convey information. Ordinances and comprehensive plan elements can make use of that information by making the occurrence of a disaster a trigger for changes to land use restrictions or levels of service for vulnerable infrastructure segments. Such changes might include: increased setback requirements; only granting permits for coastal redevelopment if the property owner eliminates hard armoring or covenants to abandon the property in part or *en toto* after next storm; or requiring that the restoration of an infrastructure segment must be preceded by a review of the cost effectiveness of maintaining it using its current design parameters. St. Augustine could also make use of disaster planning for two additional purposes:
  - to educate—and gather information from—the public about gaps in preparedness relative to expected future flooding and storm impacts;
  - and to make adaptation measures and initiatives compatible with the criteria used by the Federal Emergency Management Agency (FEMA) when allocating grant funding for disaster mitigation programs.

- *Making level of service or capital spending contingent (section 4.1.2)*
  St. Augustine is experiencing several instances where routine nuisance flooding might lead to the City to curtail maintenance or even abandon roads and bridges. St. Augustine should consider adopting policies that limit spending in instances where retreat or

redesign would be more cost-effective than reconstruction or hard armoring. The same can be said for planned capital investments.

- *Designate Adaptation Action Areas or AAAs (section 4.2.4 and Appendix A)*
  An AAA is a highly flexible form of zoning overlay that the Florida legislature devised expressly for the purpose of facilitating local adaptation planning in the face of the impacts of SLR. Within the boundary of an AAA, St. Augustine could employ one or more policies that are distinct from what governs other parts of the City. And, because Florida law leaves it to localities to devise criteria for designating AAAs, St. Augustine would have the option not only to choose where to draw the AAA's boundary but whether to do so in a way *that is expressly subject to change as environmental circumstances change*. Such an approach can send a powerful signal about future conditions *and* regulatory responses to those conditions.

Section 4.3 proposes the following more specific adaptation measures:

- *Act now to address the revision to the City's Flood Insurance Rate Maps (FIRMs) (section 4.3.1)*
  FEMA's updated FIRMs for St. Augustine are slated to become effective in June. The City should consider two responses to that change. First, it should inquire whether FEMA would consider delaying and reevaluating the preliminary map segments covering St. Augustine, perhaps by including Hurricane Matthew in the storm set from which FEMA derives some of its flood elevations. Second, if FEMA indicates that it is too late to reevaluate its preliminary map, the City should consider imposing some form of supplementary designation, such as an AAA, in locations where the FEMA floodplain will shrink upon the preliminary maps becoming effective and possibly also in other locations where flooding is expected to occur in the foreseeable future but which are beyond the FEMA-designated floodplain.

- *Install more Low Impact Development / Green Infrastructure on public property and encourage its installation on private property (section 4.3.2)*
  St. Augustine's stormwater management system is caught in a pincer: SLR on one side and increasingly frequent and intense rainfall on the other. Adding to the City's complement of Low Impact Development / Green Infrastructure would help take pressure off of that system. The City can do this directly by replacing impervious surfaces on public property, and indirectly by providing information and support to private property owners. Reducing stormwater utility fees for property owners who reduce the impervious cover on their property is one way to provide such support.

- *Make targeted upgrades to the stormwater management system (section 4.3.2)*

St. Augustine should move ahead with plans to make its stormwater management system more robust to higher sea levels. However, it should take a systematic approach as it decides how much to spend and where. That is, the City should not invest in expensive forms of SLR accommodation whose value is likely to be undermined quickly if a high-SLR scenario materializes.

- *Clarify the City's options for wastewater management now to better inform the hard choices ahead*
  The wastewater treatment plan (WWTP) in St. Augustine is already vulnerable to flooding, and that vulnerability is expected to increase. Because of the WWTP's indispensable role in the City, and because of the expense of *any* adaptation measures that would seek to make it less vulnerable to flooding, it is important that St. Augustine grapple with its options for the WWTP sooner rather than later. The charrette proposal described in section 4.3.2 would engage the public in the process of clarifying and evaluating the City's options, and would thereby also lay the groundwork for whatever difficult decisions follow.

- *Direct queries and suggestions to the Florida Department of Transportation about adapting roads and bridges maintained by the state (section 4.3.3)*
  Several of St. Augustine's arterial roads and major bridges are under the control of the Florida Department of Transportation (FDOT). Several of those road and bridge segments are also vulnerable to flooding. As the City develops its adaptation agenda, it should keep FDOT informed about plans for local adaptation measures affecting or affected by road and bridge design and maintenance decisions, particularly if local plans would be reinforced—or undermined—by FDOT's present approach.

- *Ensure that decisions about vulnerable road and bridge segments are cost-effective (section 4.3.3)*
  Recognizing that the costs imposed on road and bridge upkeep by flooding of all sorts will continue to mount, St. Augustine should make cost-effectiveness a basic criterion for future road and bridge designs, levels of service determinations, and maintenance schedules. At the outset, this might involve employing a budgeting baseline like the one discussed above, but it should eventually involve more formal measures, such as revision to the comprehensive plan transportation element (section 4.2.3) or an express statement via ordinance that some road and bridge segments' level of service will be contingent on their relative costs remaining close to the City-wide average.

- *Modify the Historic Preservation comprehensive plan element to better allow for the decisions ahead (section 4.3.4)*

The City's Historic Preservation element does not contemplate that changing environmental circumstances will be a source of pressure on the integrity of historic buildings and districts. The element should be revised through an organized decision-making process that will ensure that the allocation of resources toward preservation is consistent with public priorities and good technical practice.

Note on Exclusions

This document does not contain instructions for St. Augustine about how to respond to its changing environmental circumstances. It does not contain an exhaustive list of adaptation options, or a map of the legal issues the City might encounter if it opts for one approach instead of another. Instead, it contains information about the challenges that St. Augustine already faces and can expect to face as sea level rises, information about approaches other localities have taken to similar challenges, and proposals and measures—all of which would need to be fleshed out and refined before they could be considered for implementation by one or more of the City's departments.

CONTENTS

Introduction: Sea Level Rise in Florida and the Coastal Resiliency Initiative

Florida communities are experiencing adverse effects of sea level rise (SLR), stronger coastal storms, and more intense precipitation events,[1] and these effects are expected to become increasingly severe in the coming years and decades.[2] Seeing what is happening now and recognizing what lies ahead, a number of Florida communities have begun working to adapt to present and projected impacts.[3] Although Florida communities have taken somewhat diverse approaches to adaptation, their efforts have generally aligned with the approach suggested in the National Oceanic and Atmospheric Administration's U.S. Climate Toolkit: 1) identify climate-related changes and risks, 2) assess vulnerabilities, 3) investigate possible responses, 4) prioritize responses to achieve near- and longer-term adaptation goals, and 5) execute and evaluate outcomes.[4]

The Florida Department of Economic Opportunity (DEO) is leading the pilot phase of the Community Resiliency Initiative in partnership with the Florida Department of Environmental Protection and with support from the Division of Emergency Management and the National Oceanic and Atmospheric Administration. The Initiative provides technical assistance to coastal communities in Florida that want to integrate effective adaptation and improved resiliency into their plans for development in the midst of SLR. By inviting localities to take the lead, the Initiative ensures that the efforts it supports are consistent with local circumstances and priorities regarding public safety, the economy, natural resources, and others.

St. Augustine is one of three localities participating in the Community Resiliency Initiative pilot, which entails tasks that correspond to the second and third steps of the Climate Toolkit approach to adaptation listed above. Concretely, the Initiative will provide St. Augustine with a Coastal Vulnerability Assessment and this Adaptation Plan. During Phase I of the Initiative, Dewberry, Inc. developed the Coastal Vulnerability Assessment in collaboration with local

---

[1] L.M. Carter et al., *Ch. 17: Southeast and the Caribbean, in* Climate Change Impacts in the United States: The Third National Climate Assessment 396, 400–05 (J.M. Melillo et al., eds., 2014), https://perma.cc/8AG2-7ASJ; Florida Oceans and Coastal Council, Climate Change and Sea-Level Rise in Florida: An Update of "The Effects of Climate Change on Florida's Ocean and Coastal Resources." [2009 Report] (2010), https://perma.cc/44Q3-EUMJ (discussing effects of SLR on coastal ecosystems and infrastructure).

[2] U.S. Global Change Research Program, Chapter 1: Overview and Report Findings, in Climate Change Impacts in the United States: The Third National Climate Assessment 8 (Jerry M. Melillo, Terese (T.C.) Richmond, and Gary W. Yohe eds., 2014), https://perma.cc/6S2L-66DV.

[3] *See, e.g.*, Kathryn Frank et al., Planning for Sea Level Rise in the Matanzas Basin: Opportunities for Adaptation (Aug. 2015), https://perma.cc/X593-XYNX; James W. Beever III et al., Southwest Florida Regional Planning Council, Lee County Climate Change Resiliency Strategy (Oct. 6, 2010), https://perma.cc/B5XT-EBGZ.

[4] U.S. Climate Resilience Toolkit, *Overview: Steps to Resilience*, https://perma.cc/PAA4-3BMP (last updated Nov. 16, 2016); *see also* Katherine Jacobs, Tom Wilbanks, et al., National Academies of Sciences, Adapting to the Impacts of Climate Change 135 fig. 4.1 (2010) (suggesting similar process), https://perma.cc/D3DX-G3RR. The Centers for Disease Control and Prevention (CDC) has developed a similar framework for improving community resilience. *See* Centers for Disease Control and Prevention, CDC's Building Resilience Against Climate Effects (BRACE) Framework, https://perma.cc/E6PG-538W, (last updated Oct. 22, 2015).

stakeholders. The Assessment integrates multiple layers of mapping information—topography, facilities and infrastructure locations, weather and flooding patterns, and SLR projections for the coming decades—and reflects stakeholders' input regarding the location and nature of local vulnerabilities.[5] Faculty and staff at Columbia Law School's Sabin Center for Climate Change Law and Professor Keith Rizzardi of the St. Thomas School of Law developed this Adaptation Plan using Dewberry's Coastal Vulnerability Assessment and based on the input gathered from stakeholders in a Preliminary Workshop on October 24, 2016. Whereas Dewberry's consultation with stakeholders clarified the location and nature of particular vulnerabilities, the Preliminary Workshop put those vulnerabilities into a policy and legal context and began to identify potential responses.

This Introduction has noted the programmatic context for St. Augustine's adaptation efforts. The rest of this Adaptation Plan proceeds in four sections. Section 1 summarizes the generic adaptation framework and goals that are basic to this Plan. Section 2 reviews the vulnerabilities that Dewberry identified and that Preliminary Workshop participants discussed in more detail. Section 3 discusses local and regional circumstances relevant to both vulnerabilities and potential responses, with a particular focus on coastal development and the impacts of nuisance flooding on the management of stormwater, roads, and bridges. Section 4 discusses priority-setting and potential responses to local vulnerabilities. In addition to these sections, Appendix A describes the relevant legal context, covering not only materials that were presented to stakeholders at the Preliminary Workshop but also additional information about requirements and limits for local action in support of adaptation.

1. Conceptual Framework for Adaptation

This section introduces general answers to several key questions: What does adaptation to SLR involve? What does it aim to achieve? What policy tools are available to pursue those aims? What measures should take priority over others?

1.1. What does adaptation to SLR involve?

Answers to the first question sometimes use different terminology, but consistently describe the same basic measures for coastal communities confronting SLR:

- **protecting** current land uses and activities in vulnerable areas;
- **accommodating** SLR by modifying current uses and activities to reduce vulnerabilities;
- **retreating** from places vulnerable to SLR; or

[5] Dewberry's Coastal Vulnerability Assessment based its projections of SLR on those issued by NOAA in 2012 and the Army Corps of Engineers in 2015. St. Augustine Vulnerability Assessment at 9; *see also* Adam Parris et al., NOAA, Global Sea Level Rise Scenarios for the United States National Climate Assessment: NOAA Tech Memo OAR CPO-1 (Dec. 2012), U.S. Army Corps of Engineers, Climate Change Adaptation: Sea-Level Change Curve Calculator (2015.46).

- **avoiding** development in locations where structures or people would be vulnerable.[6]

Protecting part of a coastline means interposing barriers between rising seas and landward infrastructure, assets, and people with the goal of preventing SLR from disrupting or otherwise forcing changes to existing landward patterns of economic and other activity. This category of adaptation measures uses "hard armoring," such sea walls or revetments (see Figure 1 below), and "soft armoring," such as beach renourishment or living shorelines. Although hard armoring measures can give the impression of preserving a given shoreline segment permanently and cheaply, such measures tend to displace wave action rather than abating it, causing the waves' force to carve away—"scour"—the soils or sands adjacent to or seaward of the armored area, while also preventing natural erosion processes from replacing what is scoured away.[7] This tends to create expensive problems over time.

Figure 1. Revetment in Santa Cruz, California (note the absence of a sand beach).[8]

[6] South Florida Regional Planning Council, Adaptation Action Areas: A Planning Guidebook for Florida's Local Governments Regional Climate Action Framework: Implementation Guide 50–62 (2015), https://perma.cc/2H39-7WUC.; John R. Nolon, Protecting the Environment Through Land Use Law: Standing Ground 221 (2014).

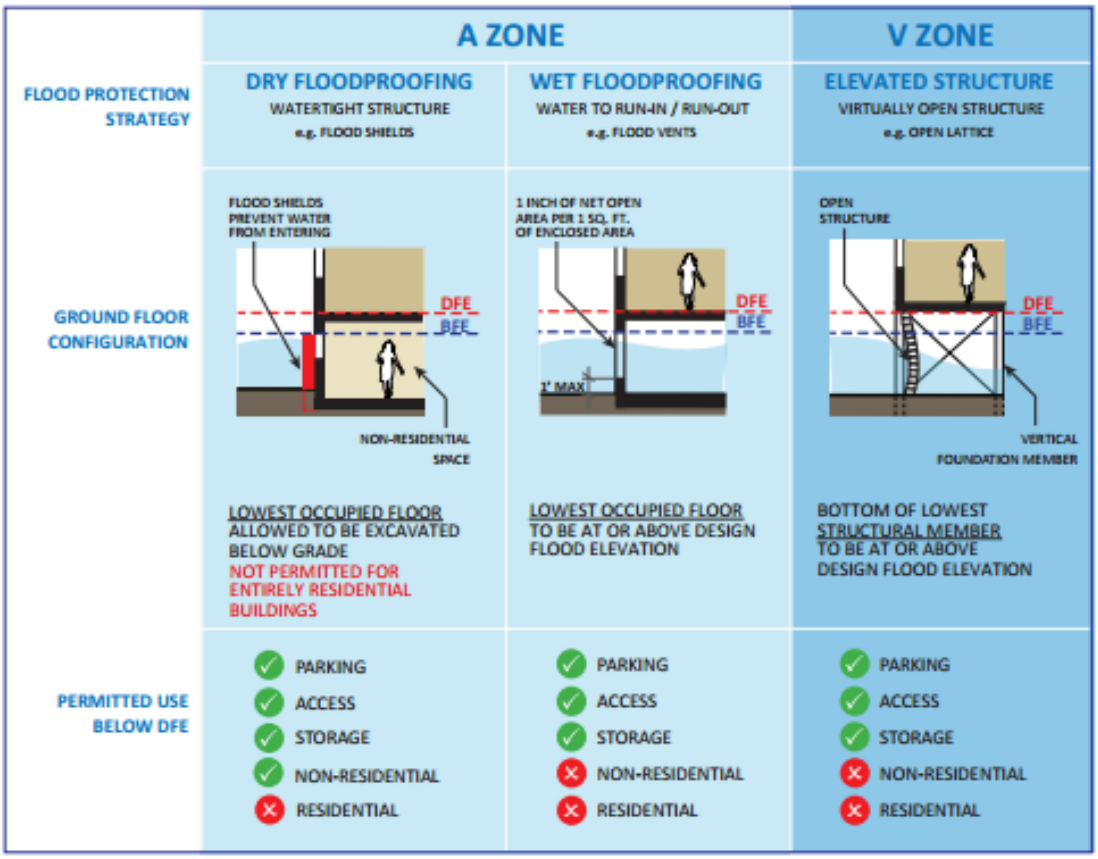
[7] South Florida Regional Planning Council, Adaptation Action Areas: Policy Options for Adaptive Planning for Rising Sea Levels 17–18 (Nov. 2013), https://perma.cc/U2NZ-TZMG ("Many studies report that hard armoring does more damage in because flooding and erosion on neighboring properties can be exacerbated and natural resources such as beaches and wetlands can be damaged or stunted from migrating naturally"); Molly Loughney Melius et al., 2015 California Coastal Armoring Report: Managing Coastal Armoring and Climate Change Adaptation in the 21st Century 8–11, (2015) https://perma.cc/9AQA-4EXH (describing adverse effects of hard armoring).

[8] Gary B. Griggs, *The Effects of Armoring Shorelines—The California Experience*, *in* Puget Sound Shorelines and the Impacts of Armoring—Proceedings of a State of the Science Workshop, May 2009 (Hugh Shipman et al., eds. 2010), https://perma.cc/FN54-7425.

Soft armoring, sometimes also called "natural infrastructure," is generally favored by scientists, planners, and civil engineers relative to hard armoring, but is usually feasible only where development (i.e., asphalt, concrete foundations, structures, and infrastructure) can be displaced or has not encroached too close to the water's edge.[9]

Accommodation means changing how land in the path of SLR is used so that the assets and people engaged in or reliant on those uses are made less vulnerable. Examples of physical accommodation include elevating buildings, moving mechanicals to upper floors or rooftops, up-rating machinery and infrastructure to endure inundation by saltwater, and retrofitting stormwater management systems with one-way valves that allow stormwater to drain into the ocean but prevent seawater from flowing to low-lying City streets (see Figures 2 and 3, below).

Figure 2. Building floodproofing options for different FEMA-designated zones.[10]

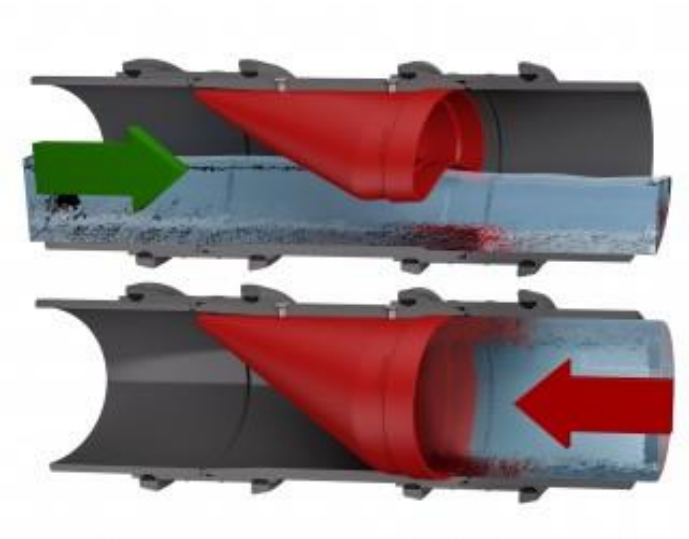


"BFE" indicates base flood elevation; "DFE" indicates design flood elevation, which is BFE plus freeboard requirements designated for particular areas and building types.

[9] Robert Verchick & Joel Scheraga, *Protecting the Coast*, *in* The Law of Adaptation to Climate Change: United States and International Aspects 18–19 (Michael B. Gerard and Katrina Kuh, eds., 2012).

[10] *See, e.g.*, City of New York Department of City Planning, Coastal Climate Resilience: Designing for Flood Risk 16–17 (June 2013), https://perma.cc/7VWS-BLFL.

Figure 3. Diagram of tidal backflow prevention insert.



Flexible insert gives way to water flowing from one direction but blocks water flowing from the other.

Accommodation also encompasses changes not just to physical structures but to systems and information—such as revised emergency planning protocols or mandatory notices in real estate transactions for vulnerable properties—and patterns of use—such as shifting commuter car traffic away from a coastal route to a more landward one.

Partial or full retreat involves abandoning land made vulnerable by rising seas and is appropriate in situations where SLR makes continued use and maintenance of existing structures—even in modified form—prohibitively costly. Retreat is conceptually simple, but establishing criteria and implementing decisions to retreat is nearly always complex and politically difficult.[11] In particular, efforts to undertake retreat often raise contentious questions about ownership, value, and liability in relation to assets that are to be moved, demolished, or left behind. Even more fundamentally, retreat tends to strain community cohesion and residents' shared sense of place.

Retreat necessarily involves avoiding new development in the area being abandoned to rising seas. Whether such avoidance follows retreat or precedes any effort to develop a vulnerable area in the first place, it entails a prohibition on development. Thus while the result of this strategy is avoiding new vulnerabilities, it can usefully be thought of as a prohibition on imprudent development.[12]

[11] *See* C. Kousky, *Managing shoreline retreat: a US perspective*, 124 Climatic Change 9, 9 (2014), https://perma.cc/5MY2-NVP3 ("Retreat could be left to the market . . . however, the market is unlikely to lead to optimal levels or types of retreat in all locations.").

[12] *Id.* ("realistically, the actual choice may be allowing development to occur and persist past the optimal time or at a greater intensity versus preventing it altogether.").

In rare instances, a community might adopt measures that fit squarely and exclusively into just one of the foregoing four adaptation categories. The Quinault Tribe of Washington State, for instance, is not repairing the sea wall that is losing the battle to protect its village of Taholah from the encroaching Pacific Ocean.[13] Instead, the tribe is simply retreating. That is, they are moving the whole village, which is home to about 700 people, to higher ground.[14] But their case is exceptional; more often, coastal communities looking to adapt will make use of all four of the foregoing types of measures in combination.

1.2. What does adaptation aim to achieve?

Using some combination of the approaches described above, coastal communities vulnerable to SLR generally pursue one or more—or all—of the following five goals:

- make infrastructure and the built environment robust to expected changes;
- make systems—physical or organizational—that are vulnerable to SLR more flexible by altering and/or moving their components;
- enhance the ability of natural systems to reduce vulnerabilities;
- identify maladaptations and begin undoing them; and
- inform the public about the short- and long-term risks that SLR will create.[15]

Some of these goals obviously complement each other: for instance, making built systems more flexible can involve enhancing neighboring natural systems' capacity for resilience. However, some of these goals can potentially conflict: for instance, making infrastructure robust to change can mean reinforcing rather than undoing maladaptations. Just as conflicting adaptation measures make each other less cost-effective, ensuring that adaptation efforts are mutually supportive is a means of avoiding unnecessary expense.[16]

1.3. What policy tools are available to pursue these aims?

In the Preliminary Workshop conducted on October 24, 2016, we reviewed various policy tools available to localities seeking to adapt to SLR:

- Transferable Development Rights;
- Incentives;
- Setbacks and Buffers;
- Rebuilding Restrictions;
- Stormwater Utility;
- Special Assessments; (continued on p.7)

[13] NOAA, U.S. Climate Resilience Toolkit, *Case Studies: Quinault Indian Nation Plans for Village Relocation*, https://perma.cc/3PC4-79B3 (last updated Dec. 2, 2016).

[14] *Id.*

[15] Richard J.T. Klein & Richard S.J. Tol, Adaptation to Climate Change: Options and Technologies, An Overview Paper, United Nations Framework Convention on Climate Change Secretariat, FCCC/TP/1997/3, at 6 (Oct. 1997), https://perma.cc/N52P-7EM6.

[16] *See* National Academies of Sciences, *supra* note 4, at 135 fig. 4.1 (noting importance of identifying opportunities for synergies and co-benefits across sectors).

- Building Codes and Design;
- Floodplain Regulations;
- Zoning and Overlay Zones;
- Hard- and Soft-Armoring Permits;
- Conditional Development;
- Impact Fees;
- Conservation Easements;
- Real Estate Disclosures;
- Coastal Land Acquisition Programs; and,
- Land Trusts.

The South Florida Regional Planning Council's *Adaptation Action Areas Planning Guidebook*, and *Policy Options for Adaptive Planning For Rising Sea Levels*, both of which are available online,[17] describe each of these tools. For example, whereas a conventional setback simply demarcates the line beyond which private property owners may not develop their property, a tiered setback restricts particular types development based on risk: bigger and less resilient structures must be set back farther than smaller and more resilient ones.[18] A tiered approach to setback can be combined with use of annual erosion lines to demarcate where each tier begins.[19] Georgetown Climate Center's 2011 Adaptation Toolkit also provides a helpful set of summaries and more thorough descriptions of how each of these tools can be applied to the task of adapting to SLR.[20]

In addition to describing these tools and noting examples of their use in particular localities (e.g., transferrable development rights in Monroe County, an overlay zone in Yankeetown, a stormwater utility in Bay County), the *AAA Planning Guidebook* also provides two tables that align each tool with a particular "management category" (for instance, "setbacks and buffers" align with shoreline conservation and also with stormwater management).[21] As these tables show, a given tool can be useful for more than one category of infrastructure management or adaptation.

A further type of policy tool relates not to land use restrictions but to the level of service provided to residents and businesses by segments of infrastructure networks, such as roads and the wastewater management system. If erosion or flooding impacts incidental to SLR are making maintenance of a segment of infrastructure prohibitively expensive, a locality can decide to downgrade the level of service it will provide to those who might rely on that segment. A locality can also signal years or even decades in advance that it anticipates making such a downgrade. It can do so using an ordinance and/or an amendment to its planning documents (discussed in Appendix A: Legal Context). In the aftermath of a case disputing the adequacy of maintenance

[17] Adaptation Action Areas Guidebook, *supra* note 6, at 50–62, https://perma.cc/2H39-7WUC; Policy Options for Adapting Planning, *supra* note 7, at 12–26, https://perma.cc/U2NZ-TZMG.

[18] *Id.* at 54.

[19] *Id.*

[20] Jessica Grannis, Georgetown Climate Center, Adaptation Tool Kit: Sea-Level Rise and Coastal Land Use How Governments Can Use Land-Use Practices to Adapt to Sea-Level Rise 2–4, 19–62 (Oct. 2011), https://perma.cc/L4KJ-PM6E.

[21] Adaptation Action Areas Guidebook, *supra* note 6, at 62, 132.

of a road segment north of St. Augustine in St. Johns County, a group of Florida attorneys expert in adaptation and land use drafted a model ordinance that localities seeking to downgrade the level of service for a particular road segment—but also to avoid litigation—could adopt.[22] That model ordinance creates a special category for the purpose: "any road categorized as 'environmentally compromised' under this ordinance shall be the subject of a requested design/maintenance exception."[23] It provides thorough definitions of key terms, such as "environmentally challenging location" and "environmentally compromised local road segment," which support decisions to reduce a given road segment's level of service based on the cost of its upkeep relative to that of other local road segments. By making the *relative* cost of upkeep (rather than simple dollar-amounts) the threshold for level of service reduction, the approach taken by the model ordinance creates flexibility for a local government confronted with both budget constraints and multiple acute adaptation issues.

1.4. What measures should take priority over others?

Translating adaptation goals and tools into a plan for action means making a series of decisions, first about what the community wants, then about how much the community is willing to spend, and finally about how and when to allocate that spending among competing priorities. In practical terms, the last of these means deciding both what measures would be most cost-effective and the order in which they should be undertaken. The South Florida Regional Planning Council, recognizing that social, political, and economic factors—as well as technical ones—are highly relevant to the process of setting adaptation priorities, recommends use of the STAPLEE framework for decision-making.[24] STAPLEE is intended to help organize a process that takes all of the following considerations into account:

- Social - The action should be socially acceptable.
- Technical - The action should be technically feasible, help to reduce losses in the long term, and have minimal cumulative and secondary impacts.
- Administrative - The action should be implementable by the state or local government.
- Political - The action should be politically acceptable.
- Legal - The state or local government must have the legal authority to implement/enforce the action.
- Economic - The action should be cost-effective and be likely to pass a benefit-cost analysis.

[22] Thomas Ruppert et al., Environmentally Compromised Road Segments—A Model Ordinance, https://perma.cc/3RLM-DY7K (last visited Jan. 6, 2017).

[23] *Id.* at para. 1.

[24] Adaptation Action Areas Guidebook, *supra* note 6, at 63; *see also* NOAA, Adapting to Climate Change: A Planning Guide for State Coastal Managers 52–53 (2010), https://perma.cc/E4M2-M6Y7; FEMA, Developing the Mitigation Plan: Identifying Actions and Implementing Strategies (2003), https://perma.cc/56PU-K5CS (listing STAPLEE factors in detail).

- Environmental - The action should meet statutory considerations and public desire for sustainable and environmentally healthy communities.[25]

The Georgetown Climate Center's Adaptation Tool Kit provides a summary illustration (see Figure 4 below) of how a version of the STAPLEE framework can be used to evaluate applications of the tools listed above:

Figure 4. SLR Policy Tools and Criteria for Decision-making.[26]

Potential Responses	Evaluation Criteria			Governance Criteria	
	Economic	Environmental	Social	Administrative	Legal
PLANNING TOOLS					
1. Comprehensive Plans*	*	*	*	*	*
REGULATORY TOOLS					
2. Zoning and Overlay Zones*	*	*	*	*	*
3. Floodplain Regulations*	*	*	*	*	*
4. Building Codes and Resilient Design	~	~	~	~	+
5. Setbacks/Buffers	~	+	~	~	~
6. Conditional Development and Exactions	~	+	+	~	~
7. Rebuilding Restrictions	~	+	~	~	~
8. Subdivisions and Cluster Development	+	+	~	~	+
9. Hard-Armoring Permits	!	!	~	~	~
10. Soft-Armoring Permits	~	~	~	~	~
11. Rolling Coastal Management / Rolling Easement Statutes	~	+	~	~	!
SPENDING TOOLS					
12. Capital Improvement Programs	~	+	~	~	~
13. Acquisitions and Buyout Programs	!	+	~	~	+
14. Conservation Easements	+	+	+	~	~
15. Rolling Conservation Easements	~	~	+	!	!
TAX AND MARKET-BASED TOOLS					
16. Tax and Other Development Incentives	~	+	+	~	~
17. Transferable Development Credits	+	+	+	!	+
18. Real Estate Disclosures	~	~	~	~	~

Advantageous (+)	The tool maximizes benefits and is feasible.
Neutral (~)	The tool may present some disadvantages or some feasibility problems.
Disadvantageous (!)	The tool may be difficult to implement because of costs or infeasibility.

[25] NOAA, Adapting to Climate Change, *supra* note 24, at 52–53 (citing FEMA, Developing the Mitigation Plan: Identifying Actions and Implementing Strategies (2003), https://perma.cc/56PU-K5CS).

[26] Georgetown Adaptation Tool Kit, *supra* note 20, at 10–11.

Figure 4 simplifies the type of characterization that the STAPLEE process might arrive at for the tools listed in the left column, and serves to illustrate the utility of anticipating how a given adaptation tool is likely to fare when proposed to different groups of stakeholders. For instance, some tools—such as rolling easements—might be socially acceptable but limited in application and subject to legal uncertainty.[27] By bringing into focus the benefits, sources of support, and potential sources of opposition to application of a given tool, STAPLEE can help guide decision makers as they convene stakeholders and present arguments about why using particular tools to pursue particular goals can strike an optimal balance for the community.

In addition to encouraging a planning process that deals with all contentious issues as early as possible, adaptation planning literature counsels that communities should seek "no regrets," "low regrets," and "flexible" solutions when deciding about allocations and timing.[28] Each of these terms emphasizes the importance of not locking a community's scarce resources into investments whose value could be undermined by foreseeable potential changes to the climate and shoreline.[29] They also reflect the crucial fact that adaptation is an ongoing process rather than a finite one.[30]

2. Vulnerabilities

This section summarizes key findings from Dewberry's Vulnerability Assessment regarding the nature and severity of flooding in different SLR scenarios. Vulnerabilities to that flooding include roads and bridges, buildings, historic districts, and wastewater treatment system components and facilities.

Dewberry's Vulnerability Assessment examined the scope and effects of three categories of flooding in particular: attributable to Mean Higher High Water (MHHW; defined as NAVD88 water elevation of approximately 2 feet); nuisance (NAVD88 = 3.75 feet); and 1% or 100-year (NAVD88 = 6–10 feet). MHHW occurs daily. The following figure integrates several features of Dewberry's flooding projections. The top portion indicates expected changes in the proportion of St. Augustine's acreage that will be susceptible to flooding during each event type at different levels of SLR. (Note that the vertical scale of the top portion ranges from 20% to 80% of the city's total acreage, which Dewberry calculated using GIS data.) The bottom portion indicates

[27] *See* Thomas Ruppert, Use of Future Interests in Land as a Sea-Level Rise Adaptation Strategy in Florida (Aug. 2012), https://perma.cc/6SJM-58B5.

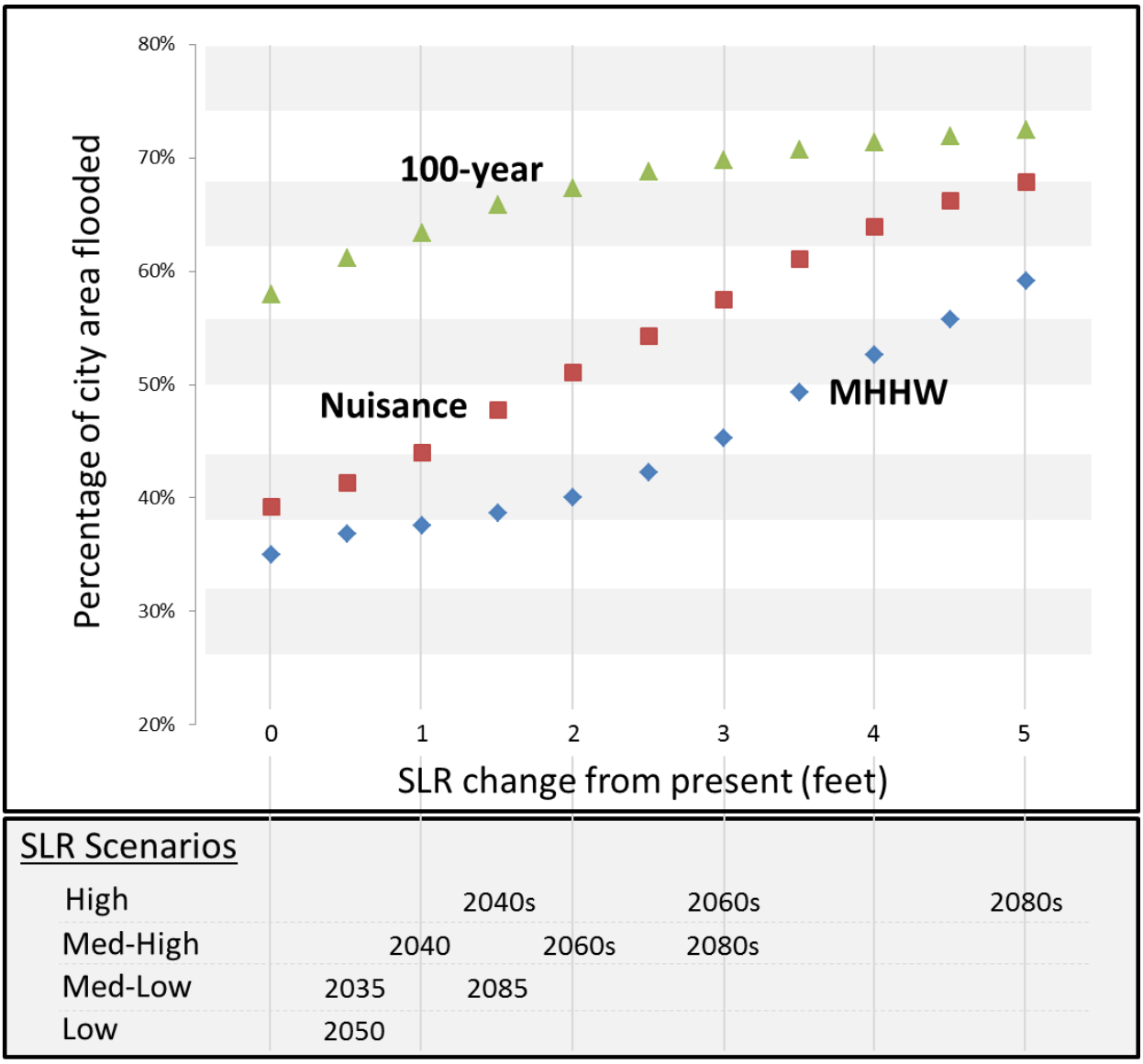
[28] William H. Butler et al., *Low-Regrets Incrementalism: Land Use Planning Adaptation to Accelerating Sea Level Rise in Florida's Coastal Communities*, J. Planning Edu. & Res. 1, 9–10 (2016); *see also* Donald Watson, *Literature Review: Principles and Practices of Coastal Adaptation in the Era of Climate Change*, *in* Coastal Change, Ocean Conservation and Resilient Communities 23, 25–26 (2016) (emphasizing need to plan for uncertainty, in part by enabling multiple programmatic options).

[29] NOAA, Adapting to Climate Change: A Planning Guide for State Coastal Managers 53 (2010), https://perma.cc/E4M2-M6Y7.

[30] National Park Service, Coastal Adaptation Strategies Handbook 2 (2016), https://perma.cc/PAN7-EA6V.

the timeframes for SLR heights in each of four scenarios (high, intermediate-high, intermediate low, and low).

Figure 5. Acres of St. Augustine covered by flood events in different timeframes and scenarios.[31]



Thus, whereas 3 feet of SLR is projected to occur by the 2060s in the high scenario, only 2 feet is projected for the 2060s in the intermediate-high scenario, and only 1 foot or so in the intermediate-low scenario. Figure 5 also shows how these scenarios correspond to different percentages of flood coverage: by the 2060s in the high scenario, nuisance flooding is expected

[31] *See* St. Augustine Vulnerability Assessment at 10, 12–13.

to occur on about 58% of city acres; in the intermediate-high scenario, 51%; and in the intermediate-low scenario, about 46%.

Using a tool created by the Federal Transit Administration, Dewberry also compiled data relating the change in flood event frequency to SLR. Those data, shown in the table below, indicate how SLR conditions affect the annual chance of flood events in turn. A 100% annual chance, marked in light blue, indicates that the event can be expected to occur at least once every year, on average.

Table 1. Changes in annual chance of flood event across SLR increments.[32]

Recurrence Interval as of Today		**Estimated Annual Chance**									
Frequency	*Annual Chance*										
"10-year"	10%	25%	50%	100%	100%	100%	100%	100%	100%	100%	100%
"50-year"	2%	6%	20%	50%	100%	100%	100%	100%	100%	100%	100%
"100-year"	1%	1%	2%	6%	20%	50%	100%	100%	100%	100%	100%
"500-year"	0.5%	0%	0%	1%	1%	1%	2%	6%	20%	50%	100%
		0.5	*1*	*1.5*	*2*	*2.5*	*3*	*3.5*	*4*	*4.5*	*5*
		SLR Increment (feet above existing condition)									

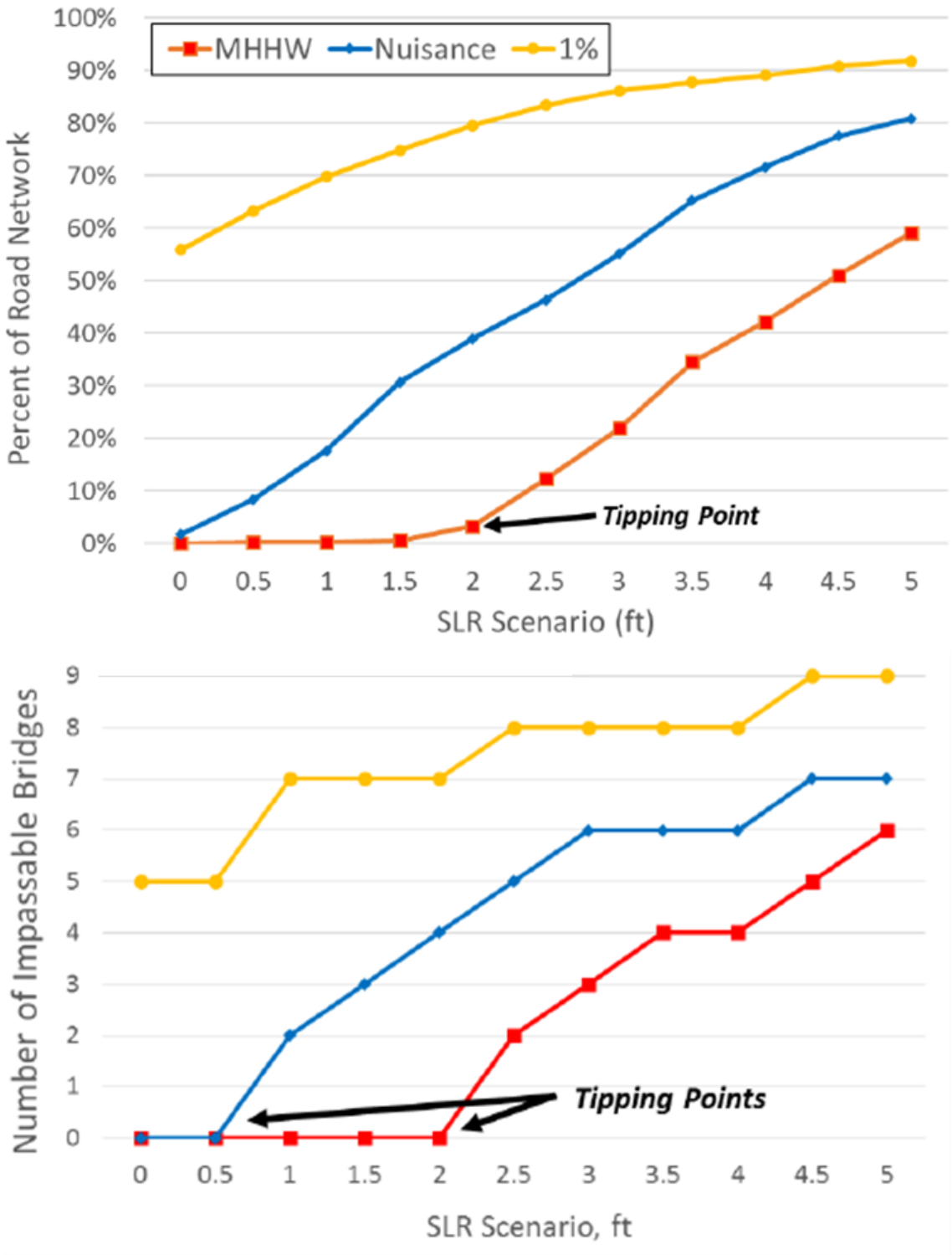
For reference, the high SLR scenario anticipates an addition of 1 foot by 2030, 2 feet by the 2040s, and 3 feet by the 2060s; the intermediate-high scenario anticipates those changes by 2040, the 2060s, and the 2080s, respectively; the intermediate-low scenario anticipates those changes by 2060, and after 2100 respectively.[33]

In addition to these indications of how SLR can be expected to affect the coverage and frequency of flood events, Dewberry also provided indications of impacts on particular infrastructure components and structures in the city. These highlight not only rates and degrees of change over time, but also tipping points at which impacts would jump in severity.

[32] *Id.* at 19.

[33] *Id.* at 10.

Figure 6. Percent of road network flooded (top), bridge flooding vulnerability (bottom).[34]



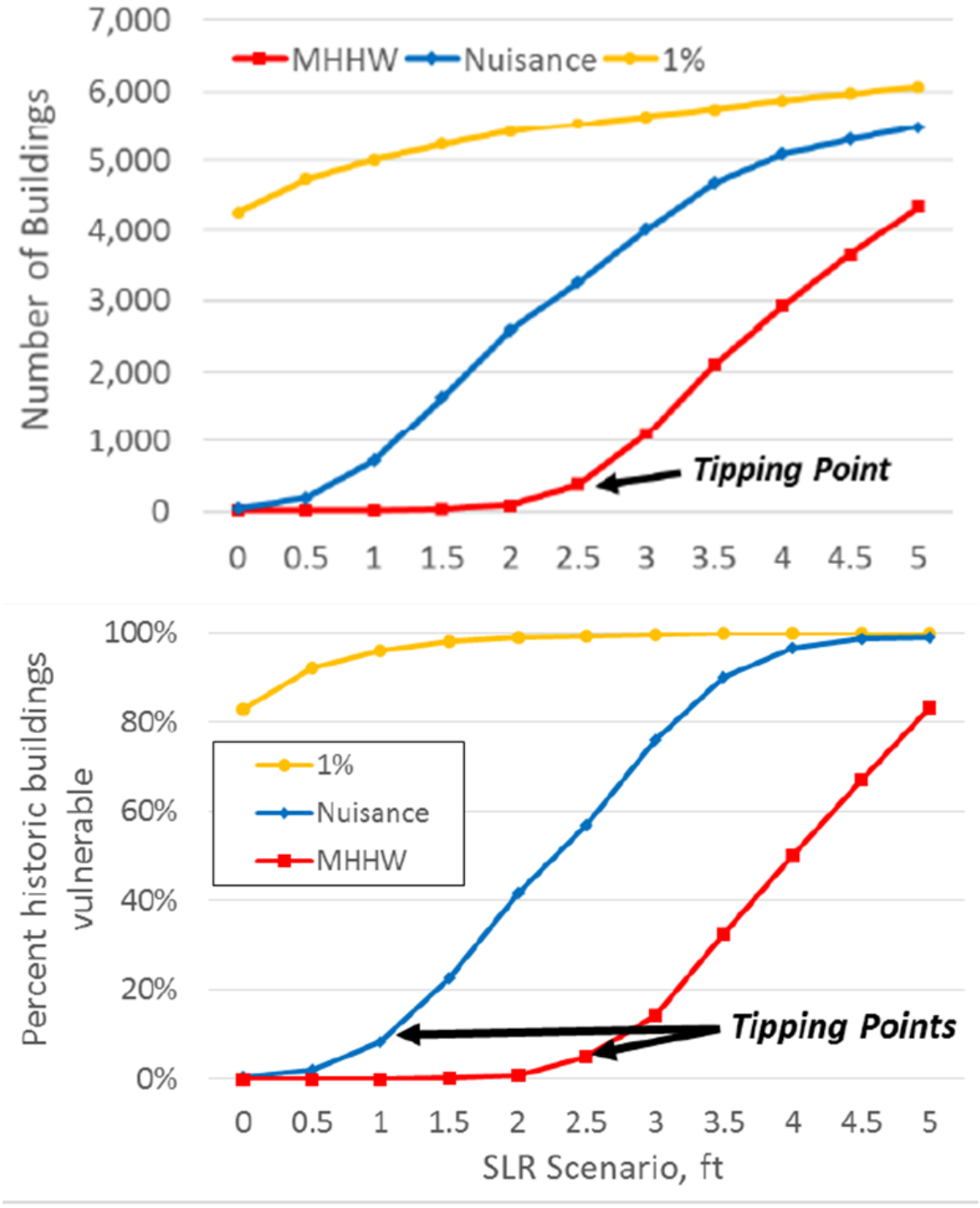
[34] St. Augustine Vulnerability Assessment at 21 fig. 9 & 30 fig. 14.

As the first of these graphs shows, nuisance flooding is expected to steadily expand its scope across the city's road network; while there is no tipping point in that curve, its rate of increase is steep as well as steady. The effect of nuisance flooding on bridge passability (second graph) follows a similar pattern, but because bridges (unlike roads) lack for easy substitutes in flood conditions it is perhaps more accurate to think of each increment of vertical increase as a tipping point for the city's complement of bridges. The three bridges that will become impassable during a nuisance flooding event with 1.5 feet of SLR include the Bridge of Lions, the West King Street bridge, and the Florida East Coast Railway bridge linking to the causeway in the San Sebastian River. The MHHW curves in both graphs, which indicate daily maximums, show tipping points at 2 feet of SLR (high scenario: 2040s; intermediate-high: 2060s; intermediate-low and low: beyond 2100).

Figure 7 shows that many of St. Augustine's buildings are vulnerable to flooding, and highlights that buildings in historic districts, which are generally located closer to the water and at lower elevations, are especially vulnerable. Notably, the historic district data reflects averages that mask the severity of circumstances facing some areas, such as the Castillo and its vicinity, and the relative invulnerability of others, such as the North City historic district.[35] This latter point deserves particular attention because, as discussed in subsequent sections, the vulnerability of historic buildings is harder to mitigate.

[35] *See id.* at 31.

Figure 7. Flooding impacts on buildings (top) and historic buildings (bottom).[36]



Although nuisance flooding was a prominent topic in the October 24th Preliminary Workshop, and although rising MHHW levels are inevitably a salient consideration, it is important to note

[36] *Id.* at 30–31.

the high starting points and higher ending points for the 1% storm event curves in these graphs. The city's recent experience of Hurricane Matthew provides a tangible demonstration of what these curves signify—indeed, Preliminary Workshop participants noted that flooding attendant to Matthew occurred in precisely the locations predicted by Dewberry's projection for a 1% chance event. The immediacy of risks posed by 1% chance events informs the emphasis that section 4 of this document places on the potential for post-disaster planning for St. Augustine's adaptation efforts. In addition to historic buildings, these three types of flood events will also inundate archeological sites and cemeteries.[37]

Components and facilities that make up St. Augustine's wastewater management system are also highly vulnerable to flooding. Here again, the recent experience of Hurricane Matthew highlighted some of these vulnerabilities. For instance, as Preliminary Workshop participants reported, flooding shorted out and effectively destroyed the electrical components of several wastewater relay pumps, which must now be replaced. It also caused a bypass event of the city's treatment plant, which Dewberry's Vulnerability Assessment notes is currently protected from nuisance and MHHW flooding by berms and wetlands (though this changes with 1.5 feet or more of SLR), but is already vulnerable to the sort of flooding that accompanied Matthew.[38] With just 1 foot of SLR, most of the structures that together make up that facility will be subject to flooding in a storm of Matthew's scale.[39]

3. Local Context and Priorities

The development of plans for adaptation measures, and implementation of those plans, will necessarily occur in a context where technical and fiscal feasibility inform but do not determine decisions. Political, economic, social, and other considerations will likely play at least as great a role, if not greater. The STAPLEE framework summarized above was devised to help communities take all of these factors into account. This subsection notes features and circumstances that are specific to St. Augustine and that give shape to the political, economic, and social features of any STAPLEE analysis of the city's adaptation options.

St. Augustine's historic districts are vulnerable, immovable, and irreplaceable. In the background of these STAPLEE features is a basic, existential conundrum: can St. Augustine adapt while continuing to embody those features that are fundamental to its current character? That character centers on its historic district's buildings and their surrounding streets, squares, and waterfront, which make the place a beloved tourist destination. Unfortunately, those buildings stand in the path of increasingly frequent and severe flooding, and their material composition make them highly susceptible to flood damage. Furthermore, efforts to make the city's historic buildings less vulnerable by elevating or relocating them would unravel significant

[37] *Id.* at 36–40.
[38] *Id.* at 34–35.
[39] *Id.* at 35.

aspects of the city's historic fabric and would be technically difficult to accomplish besides, as those buildings are largely unsuitable for either elevation or complete removal to a different location. This dire situation admits of only constrained options for adaptation: accommodation measures in the near term and at least partial retreat in the longer. Consequently, St. Augustine's circumstances are not likely to inspire enthusiastic action on the part of residents and council members in response to calls for prudent steps toward effective adaptation.

Foreseeable SLR conditions are at odds with state-determined design parameters for local roads and bridges. Several main thoroughfares and bridges, including those noted as being vulnerable to flood events, are maintained by the Florida Department of Transportation (FDOT). This means, among other things, that FDOT specifies their design parameters. Though preserving the currently-required Level of Service for these road segments and bridges is FDOT's responsibility, increasing SLR will require redesign in the foreseeable future. A further problem for adaptation efforts arising from this division of authority between FDOT and St. Augustine relates to decisions about how best to ensure that barrier island residents can be evacuated in the event of a hurricane. Whereas FDOT concluded that building an additional bridge would be best, St. Augustine planners would have preferred to consider restricting the islands' further development.

*FEMA's proposed revised FIRMs would **reduce** the scope of the City's floodplain and with it local base flood elevations (BFEs).* In response to statutory directives about how to develop flood maps, FEMA will be making two distinct, and—in St. Augustine's case—divergent types of changes to existing maps. The first is to improve the precision of topographic and historical data used for mapping. Plans to revise local FIRMs in keeping with this change have, in St. Augustine's case, resulted in a smaller flood zone.[40] The second is to integrate SLR into mapping data based on the recommendations of the Technical Mapping Advisory Council. As a California pilot study shows, these recommendations could yield maps that indicate not only BFEs for shoreline segments, but "Future BFE" and projected shoreline changes based on different SLR scenarios.[41] New York City will be the first U.S. locality to formally adopt maps of this sort.[42] There is no statutory or regulatory deadline for a nationwide application of this approach, which means that it could be several—or many—years before it leads to widespread changes to FIRMs.

[40] *See* Jake Martin, *Proposed FEMA maps remove over 10,000 structures from St. Johns County flood zones*, The St. Augustine Record, July 14, 2016, https://perma.cc/9AF6-PDAH (reporting that 10,299 structures in St. John's County will no longer be included in the designated flood zone "mostly due to high dune systems" and that 1,686 will now fall within the updated zone).

[41] FEMA Region IX Sea Level Rise Pilot Study Future Conditions Analysis and Mapping: San Francisco County, California 54 tbl. 19 & 55 tbl. 20 (Jan. 2016), https://perma.cc/Z4MG-EXC4.

[42] FEMA, Press Release: Mayor De Blasio and FEMA Announce Plan to Revise NYC's Flood Maps (Oct. 17, 2016), https://perma.cc/S3VY-VN2K ("Revised flood maps will provide New York City residents with more precise current flood risk data, in addition to providing a new map product reflecting future conditions that account for climate change.").

Many residents do not know what's coming. Rising property values in St. Augustine reflect the divergence between optimistic expectations about the future of local real estate and business and the grim projections presented in Dewberry's Vulnerability Assessment. Statements by Preliminary Workshop participants suggest that this reflects a combination of (i) lack of detailed information, (ii) skepticism about the relevance of information that is available, and (iii) a possibly unexamined expectation that significant SLR impacts will not materialize in the near future.

4. Priority-Setting, Policy Vehicles, and Potential Responses

Previous sections have described basic goals for adaptation and categories of adaptation measures, vulnerabilities particular to St. Augustine, and features of the city's community and economy that will likely enable, inform, and constrain ambitions for local adaptation. This section discusses priority-setting, likely vehicles for implementing adaptation measures, and potential responses to the vulnerabilities identified in section 2, keeping in mind the context discussed in section 3.

4.1. Priority-setting

Successful adaptation planning builds on the best available relevant information, aims to maximize adaptation-related benefits without committing irreversibly to incurring large costs ("no- or low-regrets"), gets stakeholders involved, and keeps them informed. This can, in theory, move progressively from "no regrets" to "low regrets" to "flexible" to increasingly difficult and costly solutions. It may also employ evaluation and assessment tools like those referenced above. But, practically speaking, what does this mean?

First, adaptation planning involves evaluating not only how much it would cost to install or undertake a particular measure, but also what options that measure would foreclose and how it compares to alternative means of providing some or all of the same benefits. Properly accounted for, the costs of a sea wall include not only the materials and labor involved in its installation, but also the costs of its future upkeep, the costs it imposes on adjacent properties, and the opportunity cost or lost chance to make some other use of the shoreline and of the money spent on the sea wall. In short, any evaluation of an adaptation measure is incomplete unless it considers that measure's relative cost-effectiveness for its purpose and whether the measure will raise or lower the cost of likely future options for development or adaptation.

In addition, adaptation planning involves identifying both potential responses to vulnerabilities and stakeholders that will be affected by those responses. The STAPLEE factors described in section 1.4 should guide this step: Even if a given measure is unlikely to deprive anyone of economic value, will it nonetheless cut against a social tradition or preference? Even if a measure is likely to only affect a small handful of people or businesses, is it likely to generate extensive legal battles? Furthermore, even if a measure has the potential to be popular, such popularity is not guaranteed: planners might focus on identifying and evaluating an adaptation

measure in terms of its aggregate costs, effects, legal viability, and administrative feasibility, but lose sight of the need to craft outreach and prepare responses to questions from stakeholders in order to assure its political popularity.

Balancing all relevant considerations is much easier said than done, not least because the foregoing description assumes a linear progression of steps, rather than a nonlinear, sometimes redundant set of processes taking place at the same time. The inevitable complexity and messiness of identifying, analyzing, promoting, and implementing multiple adaptation measures while carrying on with other business favors an approach that brings adaptation efforts under a common analytical and political roof. Adaptation Action Areas (AAAs) lend themselves to this sort of administrative consolidation by providing a clearly delineated physical context and administrative and legal scope for whatever changes adaptation will entail.

4.2. Policy vehicles

Although dealing effectively with SLR in St. Augustine requires swift action, the city's social, political, economic, administrative, and legal circumstances limit what can be done and how. Three vehicles in particular could be well-suited to the task of navigating these circumstances while yet supporting implementation of measures discussed in the next subsection.

4.2.1. Pre- and post-disaster planning and recovery

Enduring a natural disaster may be bad, but failing to learn from one is worse. Natural disasters play a vital role in adaptation efforts: they signal the nature and potential dangers of future events, and they create a moment of decision for communities about whether and how to reconstitute what existed before disaster struck. By forcing a decision to invest in more or less vulnerable forms of recovery, disasters also scrape away the undue optimism that can cloud individuals' and communities' approach to valued but highly vulnerable places and structures. For these reasons, and because including a disaster-trigger in a land use restriction can shield that restriction from takings claims,[43] disasters and post-disaster recovery feature prominently in adaptation literature. Recommendations for how to employ disaster scenarios (chiefly, coastal storms with accompanying flooding) in adaptation planning tend to include:

- Restrict rebuilding of structures damaged by flooding that would be vulnerable to SLR or to future flooding, whether by simply prohibiting redevelopment, imposing design requirements, or imposing setbacks on affected properties; [44]

[43] *See* Esposito v. S.C. Coastal Council, 939 F.2d 165, 170 (4th Cir. 1991) (rejecting argument that statutory restrictions on post-disaster coastal redevelopment amounted to an unlawful taking), *cert. denied* 505 U.S. 1219 (1992)

[44] *See* Anne Siders, Columbia Center for Climate Change Law, *Managed Coastal Retreat: A Legal Handbook on Shifting Development Away from Vulnerable Areas* 85–86 (Oct. 2013), https://perma.cc/Z5A2-ALQB.

- Condition rebuilding on a prohibition against shoreline armoring, thereby ensuring that the land, even if developed, will act as a buffer in the next storm; [45]
- Encourage dedication of conservation easements or pursue public acquisition of property repeatedly struck by floods or affected by SLR-driven flooding.[46]

Consistent with some or all of these recommendations, an ordinance or planning element focused on disaster recovery—and possibly based on an updated post-disaster recovery plan—could accomplish several interwoven goals in support of adaptation efforts. The most general and basic of those goals is to provide the public with information—and to gather information *from* the public—about local risks and options for mitigating those risks. Another goal is devising and implementing pre-disaster mitigation and adaptation efforts. A third goal, but perhaps the most important for this document's purposes, is aiming to minimize damage from future disasters by preventing the post-disaster restoration of vulnerabilities.

All of this argues for exploring whether to make a disaster of particular scale and scope the triggering events for significant alterations to land use and infrastructure levels of service. Of course, adding community-altering triggers into a comprehensive plan is only politically feasible if key stakeholders agree to such a step—a fact that highlights the relationship between an ambitious plan for adaptive disaster recovery and the process involved in building broad support for potentially dramatic, post-disaster adaptation measures.[47]

A further point about adaptation via pre- and post-disaster planning and recovery has to do with federal funding. The Conservation and Coastal Management Element of St. Augustine's Comprehensive Plan[48] (discussed further in Appendix A) states that the city's PDRP must distinguish between "redevelopment" and "repair."[49] This distinction is an important factor to consider when exploring options for federal disaster recovery funding for adaptation efforts. While it is possible to read federal disaster recovery law as only supporting restoration of what existed before, that reading incorrectly excludes the option of using federal funds to adopt new designs that are better able to survive the next disaster—or, where appropriate, to undertake buyouts.[50]

---

[45] *Id.*

[46] *See* Georgetown Adaptation Tool Kit, *supra* note 20, at 31–33.

[47] Carri Hulet et al., *Why Public Engagement Is Necessary to Enhance Local Readiness for Climate Adaptation*, *in* Managing Climate Risks in Coastal Communities 60–64 (Lawrence Susskind et al., eds. 2015) (discussing forms of public engagement and its indispensability to effective planning measures).

[48] St. Augustine's current (as of May 2017) comprehensive plan is available here: https://perma.cc/3XC5-KGA7.

[49] *Id.* at 79 (Conservation and Coastal Management Element Policy 10.1).

[50] Justin Gundlach & Channing Jones, *Integrating Climate Change Resilience Into HUD's Disaster Recovery Program*, 46 Envtl. L. Rep. 10282 (Apr. 2016), https://perma.cc/CQ4U-XJV7.

4.2.2. Making levels of service or capital expenditures contingent

The model ordinance mentioned in section 1.3 above can serve localities facing prohibitively expensive infrastructure maintenance schedules by preventing legal challenge of the sort that led to the *Jordan v. St. Johns County* case, discussed in Appendix A. As noted in section 1.3, the model ordinance is drafted for roads, but could arguably be applied to components of stormwater or wastewater systems that are succumbing to increasing rates of sea-borne damage. The basic concept embodied in that model legislation is that service levels should be contingent on the cost-effectiveness of maintenance. Once the cost of maintaining a given component exceeds a threshold set by average maintenance costs for other similar components, the locality can staunch the flow of public funds to that repeatedly damaged component.

This concept need not be limited to the case of foregone maintenance that inspired Ruppert et al. to draft their model. It can also be applied to planning as well. For instance, recognizing the growing threat facing particular neighborhoods on Anastasia Island, St. Augustine need not prevent redevelopment or investment through express restrictions, but it can make clear—ideally years or even decades in advance—that services relied upon by residents will be provided only so long as the cost of their provision remains proportionate to average costs elsewhere in the city. This sort of signaling can help resolve social, political, economic, and legal problems that might stymie development restrictions aimed at a similar goal.

Similarly, the city could require capital expenditures to meet a cost-effectiveness threshold to proceed. Phrased as a Policy in St. Augustine's Capital Improvement Element—which currently sets limits on spending in Coastal High Hazard Areas[51]—this might read as follows:

> Capital spending shall only be provided for the repair or upkeep of infrastructure components repeatedly damaged, degraded, or routinely impaired as a result of SLR's impacts, such as nuisance flooding, after considering alternative design standards and determining that design changes would not yield net savings over the useful life of the component or components.

The University of Florida Conservation Clinic offers two similar but harder-hitting approaches:

> Policy 1.3.2: 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.

[51] St. Augustine Comprehensive Plan, *supra* note 48, at 92 ("CI Objective 2: The City will limit capital expenditures for public facilities in Coastal High Hazard Areas as indicated on the Coastal High Hazard Area Map adopted as part of the Future Land Use Map series.").

Policy 4.1.1: Within [the most vulnerable areas], 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.

4.2.3. Adaptation Action Areas to implement 4.2.1 & .2

AAAs are an ideal means of designating the physical area(s) where measures like those just described would apply. AAAs make it possible to change important policies without rewriting zoning decisions and other plan language. They also serve an important educational, social, and political function because their basic logic is transparent to stakeholders: because SLR, which is expected to increase in predictable increments, causes flooding in a given area, that area is exceptional and will receive different policy treatment. This is not to say that AAAs simply make political challenges go away. However, they can help to inoculate adaptation measures against objections that the resulting costs and services would be allocated unfairly, and they can provide a stable foundation for any number or combination of adaptation policies.

In addition, because AAAs can be designated using objective *and dynamic* criteria, such as the frequency of flooding to a particular height, they can remove controversy from questions about the boundaries within which particular policies should apply and when to change those boundaries. Should the city decide on designating AAAs in this way, it should schedule a periodic update of AAA boundaries using a standard methodology.

4.3. Potential responses to vulnerabilities

The following potential responses to vulnerabilities identified by Dewberry could be implemented independent of one another or in any number of combinations. In several instances, combinations would likely increase individual responses' effectiveness while reducing their cost.

4.3.1. Flood maps and freeboard

FEMA's recently issued preliminary updates to the FIRMs that cover St. Augustine are not yet final; they are scheduled to be published in final form in June 2017.[52] The National Flood Insurance Program's website does not indicate a deadline for appeals of the preliminary digital FIRMs published on May 16, 2016.[53] However, even if such a deadline has already passed, St. Augustine should consider requesting a delay of final adoption and reconsideration of preliminary FIRMs that appear—based in particular on Dewberry's Vulnerability Assessment and the recent experience of Hurricane Matthew—to understate the flood risks attending a 1% flood event. FIRMs are derived from a statistically random selection of past storm and flood data and FEMA is generally receptive to requests that FIRMs reflect data addition to those initially selected for a preliminary FIRM. St. Augustine should consider asking FEMA to recalculate its

[52] FloodSmart.gov, Flood Map Update Schedule Tool, *All Communities with map updates scheduled for St. Johns County, FL*, https://perma.cc/B8DF-6L2M (last updated Sept. 2016).
[53] *Id.*

estimated flood elevations after adding data from Hurricane Matthew to the relevant storm set. FEMA, which is generally not averse to expanding flood zones relative to those mapped in a preliminary FIRM, could not deny the reasonableness of this suggestion, given that the storm hit after issuance of preliminary FIRMs.

If the preliminary FIRMs are to be adopted in June unchanged, St. Augustine should examine how the resulting changes would be translated by local ordinances and planning documents into changes to land use and development restrictions.[54] If a particular aspect of the FIRM revision appears likely to invite maladaptive development by residents or business owners, the city could consider options for maintaining at least some of the restrictions by other means. For instance, designating one or more AAAs using Dewberry's mapping of flood risks would provide a valid, transparent, and logically and legally defensible basis for restricting development in what are no longer Special Flood Hazard Areas but nonetheless remain areas susceptible to various types of flood events. Timing would be critical to such a step: signaling as early as possible that restrictions may not in fact be lifted in June 2017, notwithstanding the FIRM revision, could help avoid upset and uncertainty among stakeholders.

Preliminary Workshop participants indicated that an impending update to the state building code will impose a freeboard requirement of 1 foot in addition to the BFE requirements imposed by FEMA via the National Flood Insurance Program. The city should consider adopting an even more stringent alternative: imposing requirements of varying stringency for new or renovated structures based on the vulnerability of their location to 1% annual chance floods, as identified by Dewberry. Thus, for instance, structures located in the current zone of 1% annual chance floods could be required to add 3 feet of freeboard, those in the area projected to fall within that zone after 1 foot of SLR could be required to add 2 feet of freeboard, and those in the area projected to fall within that zone after 1.5 feet of SLR could be required to add 1 foot. While such a requirement would make it more expensive to build or improve structures in these vulnerable locations, it would also serve to inform everyone considering such development of the expected future risks—and thus the likely costs—of investing in immovable and flood-susceptible assets there. It would also counter much of the effect of FEMA's proposed revisions.

In addition to these direct responses to the prospect of revised FIRMs, the city might also consider indirect responses that inform property owners about SLR-related risks. Consider these four examples:

1. The city could require that property purchasers and/or developers be given full information about the expected future levels of SLR, as projected in Dewberry's Vulnerability

[54] *See, e.g.*, Ordinance number 10-07, § 2, 4-12-10, *codified at* § 8-428 of the St. Augustine code (defining Coastal High Hazard Areas in terms of FEMA-designated flood zones and imposing requirements on construction or substantial improvements to structures there); St. Augustine Comprehensive Plan, Capital Improvements Element ("Objective 2. The City of St. Augustine will limit capital expenditures that subsidize development in coastal high hazard areas, but will place no limitation on expenditures in those areas that enhance or restore natural resources.").

Assessment, and the impacts of SLR on levels of service for infrastructure serving the property, as determined by the appropriate city departments.

2. The city might also require that any development or redevelopment be preceded by an environmental impact analysis (i) the time horizon for which aligns with the expected life of the new structures or facilities, and (ii) that adopts the SLR projections in Dewberry's Vulnerability Assessment.

3. Rather than imposing requirements on private property owners or developers, the city could conduct a review of the sufficiency of existing shoreline stabilization measures vis-à-vis the SLR projections in Dewberry's Vulnerability Assessment. The University of Florida Conservation Clinic has drafted model language that would provide for such a review:

> Policy 2.1.2: Based on projected rates of sea level rise within the sea-level rise planning horizon the City shall inventory all existing shoreline stabilization structures and determine their capacity to maintain functionality throughout the SLR planning horizon.[55]

4. If this sort of review seems politically feasible and likely to both provide the city and individual property owners and developers with useful information, the city might consider a similar but more extensive review of planned and existing infrastructure and development or redevelopment proximate to shorelines. Here again, the U of F Conservation Clinic's model language could be useful:

> Policy 1.3.1: The City/County shall inventory all existing and planned infrastructure and land development [projects] within the vulnerable area for its capacity to accommodate projected sea-level rise over the life expectancy of the infrastructure and development [projects].[56]

4.3.2. Stormwater and wastewater management

St. Augustine's systems for managing stormwater and wastewater are vulnerable to all three forms of flooding discussed above (MHHW, nuisance, and 1% events). In some instances those vulnerabilities can be addressed with measures that are clearly cost-effective and unlikely to commit the city to large investments whose value could quickly be undermined by flood events. In other instances, however, the scale and immovability of system upgrades will require the city to make difficult decisions about the basic viability of the existing systems—with material consequences for the people and businesses they serve.

[55] Krystle Macangdang & Melisa Newmons, Sea Level Rise Ready: Model Comprehensive Plan Goals, Objectives and Policies, to Address Sea Level Rise in Florida (May 2010), https://perma.cc/JF7U-N4FY.
[56] *Id.*

Stormwater

Preliminary Workshop participants described two problems visited on the stormwater management system by SLR. The first problem is that the system facilitates nuisance flooding by connecting outfalls to city streets via subterranean conveyances. The second problem is the repeated killing of residents' lawns by saltwater or brackish inundation. Participants also indicated that the city is already planning to install backflow prevention devices at different points in the system.

One response to both of these problems could be to install various forms of low impact development (LID) or green infrastructure (GI) on public property and to encourage its installation on private property.[57] A recent SLR adaptation effort focused on the Matanzas Basin recommended this step and assembled a list of types of LID/GI suitable for St. Augustine's region:[58]

- **Bioretention cells and rain gardens (top of figure 8, below):** These are landscaped areas, often shaped into shallow depressions, that are positioned to capture and detain stormwater so that it can then slowly infiltrate into the soil beneath the cell/garden. In addition to detaining stormwater, these units capture the sediment and pollutants that would otherwise flow to adjacent bodies of water.
- **Permeable pavements:** In contrast to asphalt, concrete, or stone, these do not impede water and so allow it to infiltrate rather than running to a storm drain or a retention area. They resemble standard pavements and have similar functionality.
- **Cisterns and detention basins:** By retaining or even just detaining stormwater, these devices reduce runoff. They can also substitute for non-potable freshwater from other sources. Flagler University has installed a basin beneath one of its courtyards.
- **Bioswales (bottom left of figure 8, below):** These enclosures detain and filter stormwater flowing from sidewalks and streets. In some instances they can wholly replace storm drains.
- **Green roofs (bottom right of figure 8, below):** Reinforced roofs that are covered with growth medium and plants accomplish several things that standard roofs do not, including: retaining, detaining, and filtering stormwater; improving the longevity of the roof; and improving the energy efficiency of the structure.

[57] EPA, *Green Infrastructure: What is green infrastructure?*, https://perma.cc/Z6TN-DH23 (last updated Sept. 23, 2016).

[58] Matt Wolfe & Michael Volk, Planning for Sea Level Rise in the Matanzas Basin, Appendix G: Smart Growth and Low Impact Development (LID) 7–9 (June, 2015), https://perma.cc/K4CZ-DYRR.

Figure 8. Illustrations of installed LID/GI.[59]

In addition to these forms of LID/GI, which are suitable for public rights of way and properties owned by governments, universities, or large businesses, small changes to landscaping small private parcels can contribute to the same positive results.[60]

With this in mind, St. Augustine should consider making more direct investments in LID/GI on public property and also encouraging private property owners to do the same. It bears noting that LID/GI installation *outside* of areas subject to nuisance flooding can help mitigate levels of nuisance flooding by reducing the amount of stormwater flowing across surfaces and through the system in lower-lying areas. CDM Smith, which advised St. Augustine on various changes to its stormwater management system and utility fee in 2012 and 2013, recommended encouraging LID/GI installation.[61] However, St. Augustine does not make stormwater utility fee

[59] Photographs from EPA's *What is green infrastructure?* webpage: https://perma.cc/Z6TN-DH23.

[60] *See* St. Johns Riverkeeper, *River-Friendly Landscaping: Landscaping Your Yard*, https://perma.cc/NKB8-WG3H (last visited Jan. 26, 2017).

[61] CDM Smith, Stormwater Master Plan Update Phase 1 Final Report, at 6-5 to 6-6 (Feb. 2013), https://perma.cc/753G-T4J5.

credits available to the owners of single- or multi-family properties for impervious surface reductions or the installation of detention basins.[62] Nor does the city's website provide easily-accessible information about LID/GI options and benefits.

Another, complementary response would involve making targeted upgrades to the pipes and valves through which stormwater flows. Preliminary Workshop participants indicated that the city is already planning to install stormwater backflow valves on some stormwater system segments, and also that some components of the system are especially old. Targeting upgrades should take several factors into account, including: the current performance of the system in a given area versus level of service required for that area; the remaining useful life of the existing components or their replacements; and opportunities to couple installation of stormwater backflow valves with replacement of old or worn components. In keeping with the suggestion in the section 4.2.2 about making levels of service contingent, the city could also make the installation of stormwater backflow valves an occasion to announce the implementation of new long-term plans to accommodate SLR over the coming decades by reducing maintenance schedules.

Wastewater

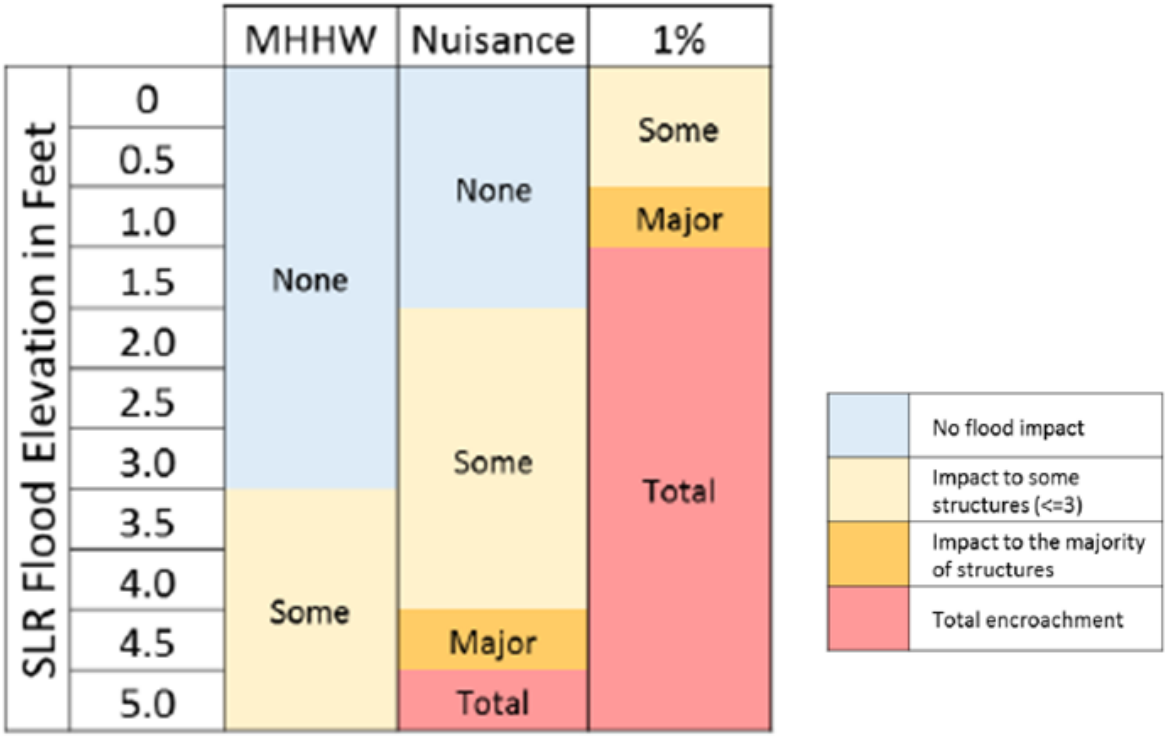
As Hurricane Matthew made clear, St. Augustine's wastewater management system is acutely vulnerable to SLR.[63] Some system components, such as the pumps whose electrical circuitry was destroyed by flooding during Matthew, can be hardened by replacement with components rated for saltwater inundation. Similarly, the city can ensure at reasonable expense that key points in the system have access to mobile backup generators during storm conditions. The same cannot be said, however, for the city's WWTP. That facility is already vulnerable to flooding (see figure 9 below), is expected to become increasingly vulnerable, and is adjacent to marshland that currently serves as a buffer against storm surge.[64]

[62] St. Augustine Code § 29-5(4) ("Credits shall not be allowed for single-family or multifamily properties.").

[63] Lynnsey Gardner, *7-foot storm surge devastates St. Augustine neighborhood*, News4JAX, Oct. 12, 2016, https://perma.cc/6DAG-U89G (Arnow's home was flooded by 4 to 5 feet of water and also raw sewage.).

[64] St. Augustine Vulnerability Assessment at 34.

Figure 9. WWTP vulnerability to different flood types at different SLR levels.[65]



Thus, while armoring and/or raising the WWTP would protect it for some number of years (depending on the SLR scenario that materializes, and on the height and strength of the armoring) such steps would be extremely expensive and armoring would damage or destroy the marsh by displacing wave energy onto it. Because this impact on the marsh would make the surrounding area *less* resilient to storms and flooding, armoring the facility would not only require a significant investment but would also, at best, be a partly maladaptive measure for the city as a whole. Furthermore, unless offsetting wetlands were created elsewhere, such a step would also be contrary to local planning provisions, which call for "[t]he City [to] pursue no net loss of wetlands."[66]

As was discussed at the Preliminary Workshop, Florida law now *instructs* localities to add a redevelopment component to their coastal management planning element, and for that component to (among other things) encourage and facilitate the "removal of coastal real property" from flood zones. The statutory language is somewhat elliptical, but it provides clear sanction for plans that encourage managed retreat for some structures and facilities from areas vulnerable to flood. Currently, St. Augustine's coastal conservation and management element provides that "post-disaster redevelopment will reduce or eliminate the risk of human life and

[65] *Id.* at 35.

[66] St. Augustine Comprehensive Plan at 73–74 (CCM Objective 4.1).

property damage by natural hazards."[67] Like Florida law, this language does not provide definitive instructions about how to respond to the wastewater management system's vulnerability, but it does provide the city with authority to "reduce . . . property damage" by either redesigning the WWTP or relocating it. Also relevant is Objective 2 of the city's capital investment element, which provides that the city "will limit capital expenditures that subsidize development in coastal high hazard areas, but will place no limitation on expenditures in those areas that enhance or restore natural resources." In sum, existing law limits the city's ability to armor the WWTP, arguably limits the city's ability to raise it in part or as a whole (depending on whether such investment is characterized as a subsidy for development), but does not limit the city's ability to relocate it.

St. Augustine's WWTP is unique among the city's infrastructure and facilities because decisions about its location, service capacity, and protection against flooding will substantially determine the range of planning options available to city residents and businesses as a whole. Decisions about the WWTP are also uniquely challenging: there is no obviously superior answer to the question of how to respond optimally to the WWTP's vulnerability to SLR.

Because all options for responding to the vulnerabilities confronting St. Augustine's wastewater management system (and its WWTP in particular) will be costly, difficult to implement, and highly consequential, this document proposes convening a planning charrette among regional experts and local stakeholders before taking any significant action. The charrette's primary objective would be to generate a thorough and detailed understanding of what different courses of action would mean in terms of costs, levels of service provision, vulnerability to SLR, and impacts (e.g., economic and environmental) resulting from armoring, redesign, or relocation of the WWTP. The charrette would necessarily consider the various costs involved in preparing for and/or recovering from one or more coastal storms that land a direct hit on the WWTP. In addition to developing a complete picture of the wastewater management situation facing St. Augustine, the exercise would also help to establish a common understanding among key decision makers and those most directly affected by their decisions about the relevant circumstances and available options.

This suggestion reflects an important assumption, namely that any significant decision about wastewater management will inevitably become politically contentious and will likely garner intense public reaction.

4.3.3. Roads and bridges

Responses to vulnerabilities in the city's network of roads and bridges necessarily fall into one of two categories: those arterial road segments and major bridges that are designed and maintained by the state department of transportation (FDOT), and those smaller road segments

[67] *Id.* at 79 (CCM Objective 10).

and bridges designed and maintained by the city. Influencing design decisions and maintenance schedules for the first category is not impossible, but it necessarily involves requests or suggestions being communicated to and approved by FDOT before being implemented. During the Preliminary Workshop, participants discussed how best to approach FDOT and what changes to suggest to existing design standards (beyond compliance with Transportation Element Objective 1.4's prescriptions for coordination among the city, FDOT, and St. Johns County). That discussion concluded that FDOT is likely to be receptive to overtures from the city, but that the city should seek indications from FDOT officials about planning timeframes, concerns or types of information they would be open to receiving from the city, and the level of detail the city should include in any submission to FDOT.

As for non-state road segments, Preliminary Workshop participants indicated that several are becoming increasingly expensive to maintain as a result of heightened rates of erosion and increasingly frequent nuisance flooding. The city's responses to this vulnerability can build on several general provisions of existing plan elements, including:

- Transportation Element Objective 1.3: The Transportation Element system shall be consistent with and support the Future Land Use Plan as depicted on the Future Land Use Map series and all subsequent amendments.
- Future Land Use Element Objective 1: The Future Land Use Map and subsequent amendments to it shall be adopted and implemented in a manner consistent with topography, soil conditions, and the availability of facilities and services to support such development.
- Capital Investment Element Objective 2: The City of St. Augustine will limit capital expenditures that subsidize development in coastal high hazard areas, but will place no limitation on expenditures in those areas that enhance or restore natural resources.

In addition to making use of these existing provisions, the city should consider adopting a new Transportation Element Objective 1.6—"The City shall address impacts of flooding, including nuisance flooding, cost-effectively"—and Policy 1.6.1—"Planning decisions shall take into account projections of future rates and patterns of flooding as well as the implications of such flooding for maintenance and other costs." The key purpose of these additions would be to establish a realistic baseline for the purpose of budgeting and planning. Doing so would ensure that, as the city considers capital investments and design and maintenance program changes in response to flooding impacts, it will not be constrained by the historical baseline of budgets and other planning documents pertaining to roads and bridges. Design and programmatic changes appear inevitable: as shown in Figure 6 in section 2 above, a large and growing proportion of the city's road segments will be flooded routinely, meaning that the "costs" side of any realistic future cost-benefit analysis should take the impacts of that flooding into account.

In addition to ensuring that flooding vulnerability features in city budgets and plans, the city should also consider establishing an AAA that would encompass street segments affected by nuisance flooding—indeed, the presence of nuisance flooding could be a criterion for designating the AAA's boundary. As explained in section 4.2.3 above, an AAA could serve as a useful vehicle for pursuing several substantive adaptation goals because it would allow the city, with no other plan or policy changes, to treat road segments differently solely because they fall within or outside of the AAA. Substantive policies that could be applied to road segments within such an AAA might include reduced levels of service, periodic or general limitations on motorized vehicle traffic, and design changes such taller curbs, deeper gutters, or road segments that are *designed* to flood and thereby to direct water away from more sensitive areas or structures.

While the model ordinance developed by Ruppert et al. in response to the *Jordan v. St. Johns County* decision could be adopted without use of an AAA, it is easy to see how the two tools might complement one another: the ordinance (whether adopted as an ordinance or incorporated into the city's Capital Improvements Element) providing a legal basis for reduced levels of service and maintenance spending, and the AAA providing a legal basis for restricting road traffic. In addition, the AAA would effectively announce the scope of expected SLR impacts in the foreseeable future, providing the public with notice not only of road service and maintenance changes but also of potential changes to land use options and infrastructure availability in the medium- and longer term.

4.3.4. Historic resources

The unique value of the city's famous historic resources derives from the integrity of their location, circumstance, character, and construction—to borrow from the National Park Service: "Because cultural resources hold significance from both place and the past, they are unique and nonrenewable."[68] Changing even one of these things can greatly diminish if not totally negate that value. Yet rising seas leave the city no choice but to adapt, and adaptation will mean making physical changes that necessarily affect—and possibly compromise—attributes relevant to the criteria used by the National Historical Society and Florida's Division of Historic Resources to distinguish historic buildings from others:

> if they possess integrity of location, design, setting, materials, workmanship, feeling, and association . . . embody the distinctive characteristics of type, period, or method of construction. * * *
>
> Ordinarily . . . structures that have been moved from their original locations; reconstructed historic buildings; . . . shall not be considered eligible for the National Register. However,

[68] Courtney Schupp et al., Chapter 5: Cultural Resources, in Coastal Adaptation Strategies Handbook 51, 51 (National Park Service, Oct. 2016)), https://perma.cc/4KNG-Y8AK.

such properties will qualify if they are integral parts of districts that do meet the criteria or if they fall within the following categories: * * *

> b) a building or structure removed from its original location but which is significant primarily for architectural value, or which is the surviving structure most importantly associated with a historic person or event; or
>
> e) a reconstructed building, when it is accurately executed in a suitable environment and presented in a dignified manner as part of a restoration master plan, and no other building or structure with the same association has survived; or a property primarily commemorative in intent, if design, age, tradition, or symbolic value has invested it with its own exceptional significance.[69]

Because these criteria allow for some flexibility, St. Augustine can strike a balance by implementing measures that respond effectively to vulnerabilities without robbing the City's historic resources of features that qualify them for the historic register and make them appealing to residents and visitors. Importantly, however, St. Augustine must strike that balance with limited financial and administrative resources. It cannot protect all of its historic district or local buildings from flooding, nor can it accommodate flooding by elevating all historic buildings (which would not survive elevation well and would no longer be of their original character besides), nor can it simply move them and their surroundings in their entirety to another location. Yet, the city can do *some* of each of these.

In order to provide basic legal and policy support for limited and cost-effective adaptation measures in relation to its historic resources, the city should consider revising the basic Goal and Objective 3 of its Historic Preservation Element. The amended Goal might read as follows: "Maintain and enhance the historic integrity and ambiance within the City of St. Augustine **amid changing environmental circumstances** while encouraging economic growth and the identification, preservation, continued use and adaptive reuse of existing historic structures."[70] The amended Objective might read: "Continue to identify, preserve and encourage the adaptive reuse of historic structures in all areas of the City**, recognizing that preservation must in some cases entail adaptation to changing environmental circumstances**." These revisions would open the door to flooding-related adaptation measures, but not to every modification a property owner might request.

This sort of basic change will facilitate other procedural and substantive measures. Procedural measures are especially important here because of the role they can play in helping the city's policymakers and residents to arrive at a common understanding of the situation and to

[69] National Park Service, National Register Bulletin: How to Apply the National Register Criteria for Evaluation, https://perma.cc/XW3C-94RT (last updated 2002); Florida Division of Historic Resources, Criteria for Listing: Criteria Used for Evaluating National Register Eligibility, https://perma.cc/Q5EW-2LZS (last visited Jan. 31, 2017).
[70] St. Augustine Comprehensive Plan at 100.

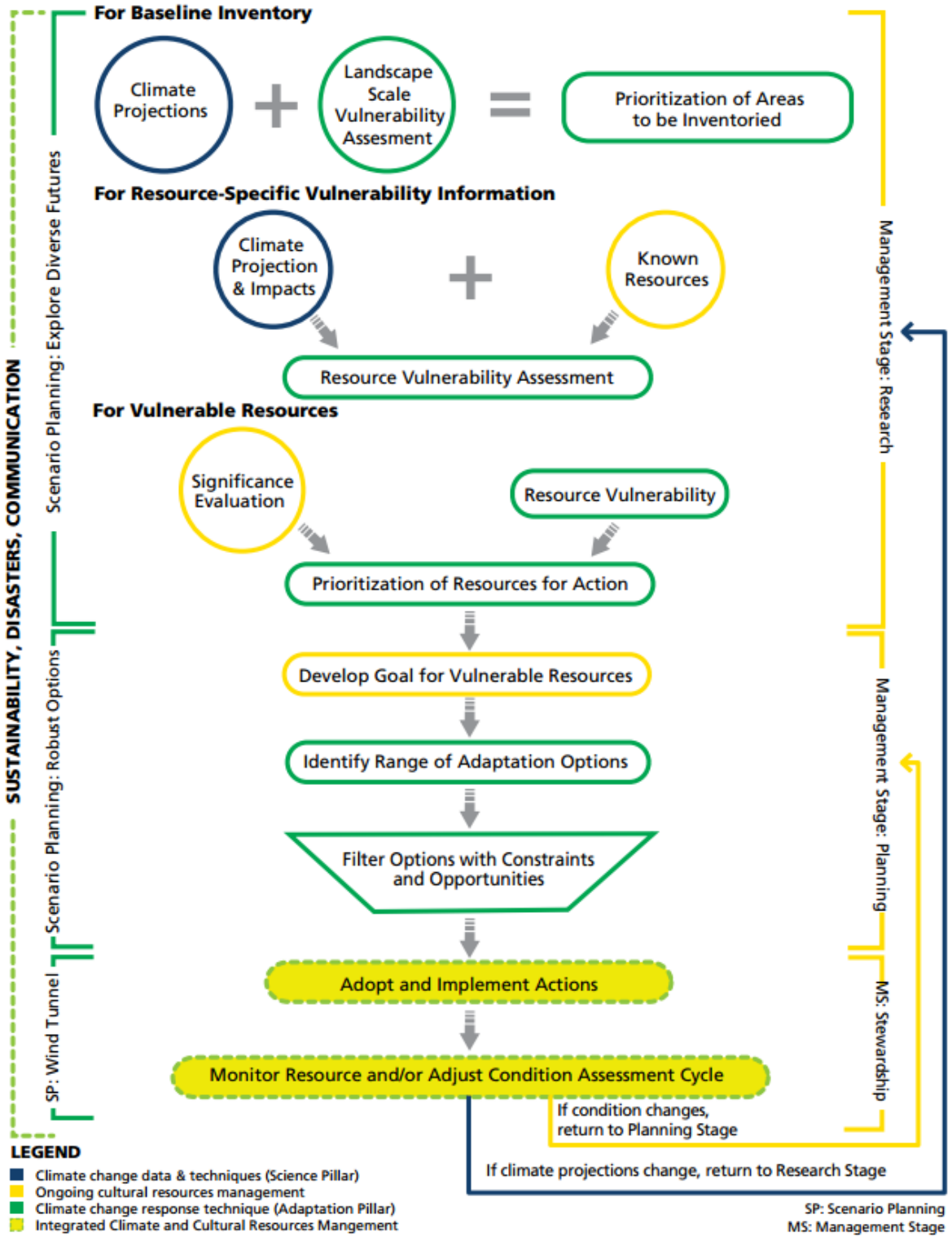
develop clear goals based on that understanding. In particular, because the fiscal and administrative capacity of the City—even engrossed by grants or investments by residents—is insufficient to the task of adapting *all* of St. Augustine's historic districts and properties to rising seas, someone must decide what to preserve and what to cease preserving. For instance, at Dry Tortugas National Park, the National Park Service assessed the various threats to the integrity of Fort Jefferson before deciding on a handful of key measures—chiefly the removal of structural iron elements that, when rusted, displaced masonry, and the reinforcement of masonry at risk for collapse.[71]

Decisions about which historic resources to preserve and how carefully to do so *could* be made on an ad hoc basis as individual owners respond to changing circumstances, or they could be made through an organized process that frames the problem as a matter for the public as well as directly-affected stakeholders. The former approach might require no changes to existing planning documents or procedures, but could lead to disorganized measures that compete or even conflict with one another. The latter approach would be more procedurally intensive, but would also be more likely to result in the cost-effective preservation of historic resources valued more highly by stakeholders and the broader public. In addition to being more cost-effective for directing resources *to* particular areas and structures, the latter approach would also be well-suited to specifying which structures would *not* be restored to historical standards after being damaged by flooding.[72]

The National Park Service developed the following flow chart to depict a generic analytic and decision-making process for historic resources. The chart is useful for several purposes but in particular for suggesting this order of analysis and decision: prioritize vulnerable resources, specify goals for priority resources, identify relevant constraints and opportunities, *and then* adopt a particular program of action. Crucially, this process begins by prioritizing—a task that, in St. Augustine, will likely involve gathering input from much if not most of the community.

[71] Dan Kimball et al., Coastal Adaptation Strategies Case Study 5: Strategic Planning and Responsible Investments for Threatened Historic Structures, Dry Tortugas National Park, Florida (2016), https://perma.cc/4UYZ-DYDQ.
[72] *See* Jonathan B. Jarvis, National Park Service, Policy Memorandum 14-02 ¶ 2.F (Feb. 10, 2014), https://perma.cc/S7EW-YW86 ("Managers should consider choices such as documenting some resources and allowing them to fall into ruin rather than rebuilding after major storms. Such decisions for loss cannot be made lightly nor without appropriate consultation and compliance.").

Figure 10. Cultural resources management and adaptation flowchart.[73]



[73] National Park Service, Cultural Resources Climate Change Strategy 27 (2016), https://perma.cc/TZ5W-SZXL.

The same National Park Service report that contains this flowchart also describes how it was employed at Cape Lookout National Seashore to arrive at key adaptation decisions.[74] Those decisions considered the following range of options:

- Simply not intervening;
- Offsetting environmental stresses by making changes away from vulnerable structures (e.g., living shorelines);
- Investing in improved resilience of structures themselves;
- "Managing change" (e.g., fostering the growth of relatively more resilient plant or tree species in an area where trees have long featured but where traditional species are struggling because of changing environmental conditions);
- Relocating resources;
- Documenting resources in preparation to lose them in part or as a whole; and
- "Interpreting the change" (e.g., using a series of photographs to communicate to visitors how the environment and the resource are colliding).

St. Augustine should make use of something like the process shown in Figure 10 to order key decisions, including ultimately which adaptation options to adopt for particular historical resources.

St. Augustine should also consider a further change to the city's plans to support the adaptation of its historic resources. This change would involve dividing the city's existing privately held historical resource inventory in two. One designation would provide for long-term preservation, and would entitle the owners to special consideration for grants and other funds in support of (aesthetically consistent) adaptation efforts, relocation, and/or post-disaster restoration. The other designation would provide for preservation only until flooding of some sort had driven the costs of restoration/preservation higher than the owner wanted to pay. As with the more general suggestions for pre-disaster planning discussed in section 4.2.1 above, this would accomplish an important form of public education about expected future circumstances as well as enabling the city to explore fiscally and practically feasible protective engineering measures (e.g., berms and small canals) for portions of historic districts.

[74] *Id.* at 34–37.

Conclusion

This Adaptation Plan serves several purposes. It describes key features of the policy and legal frameworks that underlie adaptation efforts in Florida. Drawing on Dewberry's Vulnerability Assessment and the discussion at the October 24, 2016 Preliminary Workshop in St. Augustine, it provides an overview of vulnerabilities and circumstances relevant to any effort to address those vulnerabilities. Finally, in addition to these descriptions, it provides suggestions for potential use by decision makers seeking to develop and implement adaptation measures. Those suggestions draw on inputs from St. Augustine officials, and on local and statewide efforts in Florida to identify opportunities to apply legal and policy tools to adaptation goals.

Appendix A: Legal Context

Various aspects of the law governing St. Augustine compel, support, permit, or limit its authority to pursue an adaptation agenda. This appendix does not provide an exhaustive list of relevant legal structures and provisions, but it identifies several that are especially salient and that should or must be considered as St. Augustine takes steps to adapt to SLR.

Several features of Florida law, described briefly here, deserve special attention because they are both unique to Florida and significant to any adaptation agenda. They include local comprehensive plans, legal authority for the establishment of Adaptation Action Areas,[75] SB 1094 ("Peril of Flood"),[76] and the Bert Harris Jr. Private Property Rights Protection Act.[77]

A.1. Comprehensive planning

Comprehensive plans have a constitutional quality for Florida localities.[78] Each Florida locality must maintain a comprehensive plan,[79] and all development in that locality must conform to the local Plan's provisions.[80] Those provisions appear in particular "elements," some of which are mandatory.[81] Florida's 2011 Community Planning Act removed several restrictions on local governments' authority to revise elements of their comprehensive plans,[82] a process that involves two public hearings and approvals by the local governing authority, as well as receipt and review of comments by state agencies and affected localities regarding potential adverse effects.[83] The rest of this subsection discusses: (i) particularly important planning elements and the statutory language that guides their formulation; (ii) data and analysis appropriate for planning; (iii) timeframes for planning; and (iv) Adaptation Action Areas—a form of zoning overlay that localities can use to coordinate adaptation plans and efforts.

---

[75] HB 7202, Florida Community Planning Act of 2011, *codified at* Fla. Stat. § 163.3177.

[76] SB 1094, *codified at* Fla. Stat. §§ 163.3178, 195.088.

[77] Fla. Stat. § 70.001.

[78] David L. Markell, *Emerging Legal and Institutional Responses to Sea-Level Rise in Florida and Beyond*, 42 Colum. J. Envtl. L. 1, 6–7 (2016) (citing Machado v. Musgrove, 519 So. 2d 629, 632 (Fla. 3d DCA 1987)).

[79] Fla. Stat. § 163.3167(1)(b)(2) (2015) ("Each local government shall maintain a comprehensive plan"). *See also id.* § 163.3177(1) (2015) (plans are meant to "provide the principles, guidelines, standards, and strategies for the orderly and balanced future economic, social, physical, environmental, and fiscal development of the area. . ." and to "establish meaningful and predictable standards for the use and development of land and provide meaningful guidelines for the content of more detailed land development and use regulations.").

[80] *Id.* § 163.3161(6) ("no public or private development shall be permitted except in conformity with comprehensive plans").

[81] *Id.* § 163.3177(1)(a). Mandatory elements include: capital improvements; future land use; transportation; general sanitary sewer, solid waste, drainage, potable water, and natural groundwater aquifer recharge; conservation; recreation and open space; housing; intergovernmental coordination; and, for coastal localities, coastal management. *Id.* § 163.3177(6).

[82] Fla. L. c. 77-331, Community Planning Act of 2011, *amending* F.S. §§ 163.3161, 163.3217.

[83] Fla. Stat. § 163.3184.

A.1.1. Key planning elements

Nearly all of St. Augustine's comprehensive plan elements relate to adaption efforts in some fashion, but this section focuses on two elements that are indispensable to the actions discussed in section 4 of this document: future land use and coastal management.

Future Land Use Plan Element. Florida law does not expressly instruct localities to incorporate consideration of SLR or adaptation goals into their future land use plan element, but several Florida Statutes provisions provide a solid legal basis for adding to or revising the existing element's Goals, Objectives, and Policies for that purpose. First and most fundamentally, a future land use element "shall establish the long-term end toward which land use programs and activities are ultimately directed."[84] This directive would support, for instance, including a Goal pursuant to which *St. Augustine shall ensure that land uses are compatible with sea level rise scenarios projected by the National Oceanic and Atmospheric Administration and the U.S. Army Corps of Engineers through 2050.* Other Florida Statutes provisions further buttress including language of this sort, whether as a Goal or Objective. Florida Statutes § 163.3177(6)(a)3, for instance, instructs that "[t]he future land use plan element shall include criteria to be used to: . . . Coordinate future land uses with the [sic] topography and soil conditions, and the availability of facilities and services." And, similarly, paragraph (6)(a)8 requires future land use map amendments to be based on "analysis of the suitability of the plan amendment for its proposed use considering the character of the undeveloped land, soils, topography, and historic resources on site."

Other statutory language would support more focused plan element amendments. For instance, section 163.3177(6)(a)3g, which directs that the "element shall include criteria to be used to: . . . Provide for the compatibility of adjacent land uses," has clear importance for shoreline armoring and coastal development permitting. Hard armoring is arguably incompatible with either soft armoring or a lack of armoring on adjacent parcels. Similarly, hard armoring or other forms of development reduce the buffering capacity of a shoreline vis-à-vis proximate landward property.

Some of the statutory provisions discouraging urban sprawl also lend themselves to plan element amendments focused on SLR adaptation. In particular, among the indicators of sprawl (which "the future land use plan element shall discourage"), are "[f]ail[ure] to adequately protect and conserve natural resources, such as wetlands, floodplains . . . shorelines, beaches, estuarine systems, and other significant natural systems;" and "[a]llow[ance] for land use patterns or timing which disproportionately increase the cost in time, money, and energy of providing and maintaining facilities and services . . . ."[85]

[84] Fla. Stat. § 163.3177(6)(a).

[85] Fla. Stat. § (6)(a)9a(IV) & (VIII).

Conservation and Coastal Management Plan Element. The state-level legal underpinnings of this plan element are unique for *requiring* consideration of SLR. SB 1094, enacted in 2015, revised Florida Statutes to instruct coastal localities to include a redevelopment component in their coastal development plan element. Even prior to 2015, that element was to "outline[] the principles that must be used to eliminate inappropriate and unsafe development in the coastal areas when opportunities arise."[86] SB 1094 specified that the "principles, strategies, and engineering solutions" described in that component must address flood risk arising from several sources, *including SLR*. Although these requirements are phrased a bit elliptically, they can properly be read as providing state sanction for coastal localities seeking to limit—or even "eliminate"—development that is "inappropriate and unsafe" because it is foreseeably vulnerable to the adverse impacts of SLR.

A redevelopment component is the logical place to include guidelines and restrictions that do not take effect until they are triggered by an event, such as flooding of a particular depth, a natural disaster, or even just encroachment of the shoreline to a particular height. Florida's Department of Community Affairs has published a resource that can help inform such provisions, titled *Post-Disaster Redevelopment Planning: A Guide for Florida Communities*.[87] SB 1094's requirements provide communities with good reason to adopt such measures, and also with a potent tool for inoculating restrictions on development against takings claims (discussed below).

* * *

It is important to recognize that merely mentioning SLR in these and other comprehensive plan elements will not suffice to steer St. Augustine to adapt. A recent survey of references to SLR in plan elements across hundreds of Florida localities identified a number of instances where "SLR language appears in a comprehensive plan and indicates that a government 'shall' do something" but the language calling for action "is often not self-executing."[88] As a result, the local government's comprehensive plan language "appears more proactive than the tangible actions of a local government in day-to-day operations."[89] The University of Florida's Conservation Clinic has developed model planning language to help localities inclined to do more.[90] Their model makes the protect-accommodate-retreat rubric described above into the basis for planning zones: similar issues get different treatment in the managed retreat zone than

[86] Fla. Stat. § 163.3178(2)(f).

[87] Florida Department of Community Affairs, Post-Disaster Redevelopment Planning: A Guide for Florida Communities (Oct. 2010), https://perma.cc/923X-V4R5.

[88] Thomas Ruppert & Alexander Stewart, Summary and Commentary on Sea Level Rise Adaptation Language in Florida Local Government Comprehensive Plans and Ordinances 4 (July 2015), http://perma.cc/7VU6-ZGF4.

[89] *Id.*

[90] Macangdang & Newmons, *supra* note 55. Among other things, this model language formulates Goals, Objectives, and Policies for inclusion in planning elements based on the protect-accommodate-retreat rubric. *Id.* at 11.

they do in the protect zone. Selections from that model, which are excerpted in several places below, can be useful even when taken out of that context.

A.1.2. Appropriate data and analysis for planning

Comprehensive plans must be informed by an analysis of "relevant and appropriate data,"[91] which Florida law requires to be gathered from "professionally accepted sources" or generated by the local government itself "so long as methodologies [for gathering data] are professionally accepted."[92] Usable data thus include not just the Army Corps of Engineers and NOAA datasets underlying Dewberry's Vulnerability Assessment but also data published by the Intergovernmental Panel on Climate Change, the Southeast Florida Regional Compact on Climate Change,[93] or other similarly authoritative sources.[94] Florida law also requires changes to comprehensive plans to be supported by analysis, and that such analysis must reflect reasonable and proportionate applications of the data cited.[95] "Scientific certainty" is *not* a required feature of supporting data or their analysis.[96]

The flexibility given to localities regarding data and analysis means that Dewberry's Vulnerability Analysis will not operate as either a "floor" or a "ceiling" for planning purposes. Should St. Augustine refer to the Vulnerability Assessment as supporting particular language or parameters, the city would only need to articulate a logical link between the Assessment and the action—it would not be legally prevented from adopting language that embodied more or less cautious expectations about SLR than contained in the Assessment.

A.1.3. Planning timeframes

Until the legislature enacted SB 1094 in 2015, Florida law instructed localities to use two time frames for planning: five years and ten years. This directive has allowed localities to effectively ignore slow-developing future circumstances that fall outside of this timeframe, such as SLR. SB 1094 changed this by providing that "[a]dditional planning periods for specific

---

[91] Fla. Stat. § 163.3177(1)(f).

[92] *Id.*

[93] Southeast Florida Regional Climate Compact, Unified Sea Level Rise Projection, (Oct. 2015), https://perma.cc/49LA-WP6A.

[94] FEMA flood insurance rate maps (FIRMs) would also be an authoritative source. However, FIRMs currently represent a snapshot in time that ignores SLR. FEMA, Coastal Frequently Asked Questions: Flood Hazard Mapping Questions, https://perma.cc/HYN7-XMY5 (last updated Aug. 17, 2016) ("In accordance with the current Code of Federal Regulations, FEMA does not map flood hazards based on anticipated future sea levels or climate change."). Unless and until FIRMs integrate SLR projections, their utility for planning purposes should be considered limited to the short term.

[95] The statutory language is somewhat muddier: "To be based on data means to react to it in an appropriate way and to the extent necessary indicated by the data available on that particular subject at the time of adoption of the plan or plan amendment at issue." *Id.*

[96] *See* Haire v. Florida Dep't of Agric. & Consumer Servs., 870 So. 2d 774, 786 (Fla. 2004) (quoting approvingly from opinion below the proposition that "legislatures are not limited to acting only where there is scientific certainty.").

components, elements, land use amendments, or projects shall be permissible and accepted as part of the planning process."[97] This invitation to designate time frames freely has vital implications for plans involving assets or facilities whose useful life exceeds 10 years and whose location makes them potentially vulnerable to SLR. Armed with this option, local governments considering the costs and benefits of infrastructure design parameters, planning restrictions, and capital investment options, among other things, can ensure that SLR projections inform their plans. The University of Florida's Conservation Clinic has drafted model comprehensive plan language that ensures all adaptation planning employs an appropriate timeframe:

> 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.[98]

Notably, because SB 1094's provisions do not *require* use of timeframes of more than 10 years, the law permits a locality to treat information about looming SLR impacts as beyond the mandatory planning timeframe. A locality looking to exclude consideration of SLR from consideration when making decisions about investments in, say, a facility or infrastructure asset with a 30- or 50-year useful life could therefore do so without legal consequence under this provision. Such an exclusion would be imprudent, however, given the certainty of some amount of future SLR, and given that Dewberry's projections identify where and how much particular locations, assets, and systems are likely to become vulnerable over the coming decades. Such an exclusion might also subject a locality to other legal action. (See section A.2, below.)

A.1.4. Adaptation Action Areas

In addition to giving localities more flexibility and autonomy when updating their planning elements, the 2011 Comprehensive Planning Act also authorized localities to designate as Adaptation Action Areas (AAAs) locations "that experience coastal flooding due to extreme high tides and storm surge, and that are vulnerable to the related impacts of rising sea levels."[99] The 2011 Act contemplates two purposes for this designation: "prioritizing funding for infrastructure needs" and "adaptation planning."[100] Designating one or more AAAs could also serve St. Augustine by providing the basis for various forms of notice to all property owners, permittees, and others with investments or interests in land or assets encompassed by the AAA boundary regarding SLR-related vulnerabilities and potential future changes to land use restrictions. In short, an AAA is a highly flexible and potent version of a zoning overlay,[101] which localities can

[97] Fla. Stat. § 163.3177(5)(a).

[98] Macangdang & Newmons, *supra* note 55.

[99] F.S. § 163.3164(1) (defining AAA).

[100] *Id.*

[101] For descriptions of zoning overlays and examples of their application, see Siders, *supra* note 44, at 96–97; Jessica Grannis et al., A Model Sea-Level Rise Overlay Zone For Maryland Local Governments Expert Review Report v.3 (Nov. 2011), https://perma.cc/67RX-PPWJ; Douglas Codiga & Kylie Wager, Center for Island Climate

rightly present to residents as expressly and specifically sanctioned by state law, and as a potentially important step toward seeking state and federal funds for adaptation efforts.

A further point about establishing the boundary of an AAA deserves further mention here. Florida law suggests but does not mandate criteria for AAA designation.[102] Whether St. Augustine uses those suggested criteria and/or others, it should consider expressly stating that while the criteria for AAA designation will not change, the AAA's boundary will be reviewed and updated periodically (e.g., every five years, which would align with the schedule of St. Augustine's capital improvement element)[103] *as underlying features change*. Such a statement would serve as notice that the AAA is likely to expand or shift as SLR and related topographic changes proceed along current trend lines. It would also serve as notice that, even without revisions to the comprehensive plan, the substance of policies imposed within the AAA could eventually be applied to locations it did not initially encompass.

A.2. Litigation risk

Historically, local governments have sought to reduce the risk of legal challenges by simply maintaining the legal/planning status quo. Now, as SLR shifts the ground under local governments' feet, there is no way to maintain the status quo in both physical and legal/planning terms. The result is potentially a "damned if you do, damned if you don't" situation with respect to litigation risk. If local governments act to address SLR, they could be sued by property owners claiming injury from limitations on the property's use or adverse effects on property values.[104] But local governments could also be sued for *failing* to address SLR, either by persisting with a long-standing but imprudent approach to use of publicly owned land or facilities, or by failing to amplify spending or maintenance schedules to the degree made necessary by SLR to keep some element of coastal protection or infrastructure in good repair.[105] It is important not to overstate the risk of being sued for inaction, and the discussion in A.2.2 clarifies the particular legal

Adaptation and Policy, Sea-Level Rise and Coastal Land Use in Hawai'i: A Policy Tool Kit for State and Local Governments 24–26 (2011), https://perma.cc/9QJR-HT25.

[102] Fla. Stat. § 163.3177(6)(g)10: "Criteria for the adaptation action area may include, but need not be limited to, areas for which the land elevations are below, at, or near mean higher high water, which have a hydrologic connection to coastal waters, or which are designated as evacuation zones for storm surge."

[103] Clearwater, Capital Improvements Element, at I-1, https://perma.cc/UZ47-HVGB (last updated Aug. 20, 2013).

[104] *But see* Thomas Ruppert et al., Sea-Level Rise Adaptation and the Bert J. Harris, Jr., Private Property Rights Protection Act 14–15 (2012) ("a local government defending regulations adapting to SLR should be able to make cogent arguments that, in light of such recently gained knowledge of SLR, reasonable expectations of development on low-lying coastal land should also change."), *see also id.* at 19–20 ("a local government confronted with a challenge to a land use regulation directed at adaptation to SLR might argue that the land involved is not "suitable" for the use because of "reasonably foreseeable" SLR that would render the land unsuitable for the proposed use.").

[105] This is a developing area of law. In general, governments are not to be held liable for nonfeasance. *See* DeShaney v. Winnebago County Department of Social Services, 489 U.S. 189 (1989). However, there have lately been departures from this premise in recent decisions requiring local governments to maintain infrastructure in the face of changing coastlines. *See* Thomas Ruppert & Carly Grimm, *Drowning in Place: Local Government Costs and Liabilities for Flooding Due to Sea-level Rise*, 87 Fla. Bar J. 29 (Nov. 2013), https://perma.cc/6SUM-36Q9 (discussing *Jordan v. St. Johns County*).

questions on this point that were raised and not fully answered by the *Jordan v. St. Johns County* case.

This subsection does not provide a thorough description of litigation risks related to adaptation, and is not intended to provide legal advice, but its summary of key factors highlights what courts may consider when deciding whether a government can be found liable for the effects of adaptation-related decisions.

A.2.1. Sovereign immunity

Sovereign immunity protects Florida local governments from legal challenge for some but not all of their actions.[106] Courts use four guideposts to determine whether a given action is immune, but "Florida courts have struggled to find consistency in their application of the waiver [of sovereign immunity]."[107] The first is the "operational/planning test" articulated by Florida's Supreme Court for determinations of whether an action by a state or local government reflects "quasi-legislative policy-making," which is immune from suit.[108] The test has four conjunctive parts, meaning that a government action must qualify in all four ways to merit sovereign immunity.[109] If all four answers are affirmative then the action involves "planning," is discretionary, and is immune from suit. If any of the answers is negative then the action is "operational," meaning that the law *prescribes* governmental conduct rather than leaving that conduct to the government's *discretion*, and does not immunize the government from suit for

[106] Wallace v. Dean, 3 So.3d 1035, 1045 (Fla. 2009) (citing Florida Constitution article II, § 3, which provides for separation of powers among coordinate government branches).

[107] James Wilkins, *Is Sea Level Risk "Foreseeable"? Does It Matter?*, 26 J. Land Use & Envtl. L. 437, 450 (2011). For a thorough discussion of sovereign immunity in Florida, see William N. Drake, Jr. & Thomas A. Bustin, *Governmental Tort Liability in Florida: A Tangled Web*, Fla. Bar J., Feb. 2003; Thomas A. Bustin & William N. Drake, Jr., *Judicial Tort Reform: Transforming Florida's Waiver of Sovereign Immunity Statute*, 32 Stetson L. Rev. 46 (2003)

[108] *Wallace v. Dean*, 3 So.3d at 1041 (citing Commercial Carrier Corp. v. Indian River County, 371 So.2d 1010 (Fla. 1979)).

[109] *Commercial Carrier*, 371 So.2d at 1018: 1) Does the challenged act, omission, or decision necessarily involve a basic governmental policy, program, or objective? 2) Is the questioned act, omission, or decision essential to the realization or accomplishment of that policy, program, or objective, as opposed to one which would not change the course or direction of the policy, program, or objective? 3) Does the act, omission, or decision require the exercise of basic policy evaluation, judgment, and expertise on the part of the governmental agency involved? And 4) Does the governmental agency involved possess the requisite constitutional, statutory, or lawful authority and duty to do or make the challenged act, omission, or decision?

injury arising from that conduct.[110] Florida courts' application of this test has not been especially consistent or predictable.[111]

The second guidepost complicates the first. It divides governmental functions into four categories, two of which entail liability. They are 1) legislation, permitting, licensing, and executive functions; 2) law enforcement and protection of public safety; 3) capital improvements and property management; and 4) providing professional, educational, or general services for citizens' health and welfare.[112] The Florida Supreme Court has stated that governments engaged in the first two types of functions have no duties for which they might be liable,[113] and that governments engaged in the fourth function—providing direct services—owe the same duties and bear the same risk of liability as private entities so engaged.[114] As for the third function, it seeks to distinguish between (a) initial decisions to acquire, build, or upgrade a property or facility and (b) subsequent decisions to maintain that property or facility. Whereas governments' decisions to build or upgrade are immune, maintenance efforts carry liability just as they would for a private owner or operator.[115]

The third guidepost to note is actually an exception to the upgrade/maintain distinction just discussed. It relates to a government's duty to prevent or warn about dangerous conditions arising from a facility the government owns or operates. It applies if a government 1) creates a dangerous condition, which 2) is not readily apparent to whomever it injures, and 3) the government knew of the condition yet 4) failed to warn the public or avert the danger it created.[116] Thus, even if a government demonstrates that it merely maintained a facility rather than upgrading it, it can nonetheless be found liable if a plaintiff's injury arises from facts consistent with these four conditions. Florida courts have also restated this third principle more generally: "Where a defendant's conduct creates a foreseeable zone of risk, the law generally will recognize a duty placed upon defendant either to lessen the risk or see that sufficient precautions are taken to protect others from the harm."[117]

---

[110] *Cf.* United States v. Varig Airlines, 467 U.S. 797, 808 (1984) (describing basis for operational/planning distinction as follows: "The discretionary function exception . . . marks the boundary between Congress' willingness to impose tort liability on the United States and its desire to protect certain governmental activities from exposure to suit by private individuals.").

[111] *See* Theresa K. Bowley, *A Blanket of Immunity Will Not Keep Florida Dry: Proposed Adjustments to Florida's Drainage Regulations and Sovereign Immunity Laws to Account for Climate Change Impacts*, 10 Fla. A&M U.L. Rev. 387, 403 (2015), https://perma.cc/F7BY-VX83..

[112] Trianon Park Condo. Ass'n v. City of Hialeah, 468 So. 2d 912, 919 (Fla. 1985).

[113] *Id.* at 921.

[114] *Id.*

[115] *Id.*; *see also* Thomas A. Sawaya, *Capital Improvements and Property Control Functions*, 6 Fla. Prac. Pers. Inj. & Wrongful Death Actions § 9:9 (2014).

[116] Henry P. Trawick, Jr., *Modification of Planning Versus Operational Approach*, 4 Fla. Pl. & Pr. Forms § 37:3 (2015).

[117] Kaisner v. Kolb, 543 So. 2d 732, 735 (Fla. 1989).

A.2.2. Takings—including via inverse condemnation

Takings law protects private property owners from government actions that fail to provide them with "just compensation" for the condemnation or appropriation of their real property or for regulation that deprives their real property of all or almost all of its use and economic value. In Florida, there are two sources of takings law: the Fifth Amendment to the U.S. Constitution and the Bert Harris Private Property Rights Protection Act.[118] This subsection does not provide an extensive explanation of takings law in relation to SLR; such explanations are available from other sources,[119] and provide only limited value for discussions like this one of specific programmatic SLR adaptation efforts. Instead, this subsection covers two important points—one practical, one legal.

The practical point arises from takings law being complex, unpredictable in its application to particular cases, and the source of highly fact-specific legal disputes. These features have two important implications for localities. First, plaintiffs who feel strongly about their takings claim against the locality, or about their desire to remain where they are with all the services they have typically received, may bring a lawsuit even if the legal claim is tenuous. Second, fending off such claims will likely involve marshaling detailed factual information and expert testimony—expenses that a locality must incur even if it prevails in court unless the takings claim is so egregiously implausible that the court sees fit to award the locality attorneys' fees. In short: localities planning to undertake SLR adaptation measures should anticipate takings challenges.

The legal point relates to the decision in *Jordan v. St. Johns County*, a decision from Florida's Fifth District Court of Appeal.[120] That case dealt with the question of whether the county had committed an inverse condemnation and a taking with its temporary moratorium on maintenance on a 1.6-mile stretch of the only road, "Old A1A," that connected a housing subdivision on a barrier island to the mainland.[121] Due to repeated storms and persistent erosion, that maintenance threatened to devour the whole of the county's annual transportation budget.[122]

---

[118] Fla. Stat. §§ 70.001.

[119] *See, e.g.*, Siders, *supra* note 44, at 13–17; Michael Allen Wolf, *Strategies for Making Sea-Level Rise Adaptation Tools "Takings-Proof"*, 28 J. Land Use 157 (2013), https://perma.cc/WVH8-QZLP; *see also* David Dana, *Incentivizing Municipalities to Adapt to Climate Change: Takings Liability and FEMA Reform as Possible Solutions*, 43 B.C. Envtl. Aff. L. Rev. 281 (2016), https://perma.cc/KB7M-V3WJ; J. Peter Byrne & Kathryn A. Zyla, *Climate Exactions*, 75 Md. L. Rev. 758 (2016), https://perma.cc/5NYY-YNZK; Sean Hecht, *Taking Background Principles Seriously in the Context of Sea-Level Rise*, 39 Vt. L. Rev. 781 (2014-2015), https://perma.cc/YE5F-2RQN; Christopher Serkin, *Passive Takings: The State's Affirmative Duty to Protect Property*, 113 Mich. L. Rev. 345 (2014), https://perma.cc/W3RU-XH9B.

[120] 63 So. 3d 835 (Fla. 5th DCA 2011), *rev. declined*, 77 So. 3d 647 (Fla. 2011).

[121] *Jordan*, 63 So. 3d at 837; *see also* Rubano v. Dept. of Transp., 656 So.2d 1264, 1266-67 (Fla. 1995) ("A taking may occur when governmental action causes a lack of access to one's property even when there is no physical appropriation of the property itself.").

[122] Ruppert & Grimm, *supra* note 105, at 29 ("According to the county, the only feasible way to protect the road from the 'ravages of the ocean' was an expenditure by the county of more than $13 million to elevate the height of the road by placing large amounts of sand along its entire length from the right-of-way down to the mean high-water mark. The county argued it would have to spend an additional $5 to $8 million every three to five years to maintain

The court in that case agreed with the county that its temporary moratorium was rationally related to public safety and ruled that the moratorium did not amount to an inverse condemnation. The court also stated that Florida law does not give courts the authority to issue injunctions instructing perpetual performance of a duty. However, the court did not reject all of the plaintiff's arguments. It declared that "the County has a duty to reasonably maintain Old A1A as long as it is a public road dedicated to public use," and must ensure that the road provides "meaningful access."[123] It did not further define "reasonably maintain" or "meaningful access," and even stated that "[w]e do not hold that the County has the duty to maintain the road in a particular manner or at a particular level of accessibility."[124] It also left open the possibility that a future claim for taking via inverse condemnation *could* prevail: "governmental inaction—in the face of an affirmative duty to act—can support a claim for inverse condemnation."[125] Importantly, the court did not decide whether the county had actually fulfilled its duties or effectively abandoned the road, but remanded the case to the trial court to resolve the underlying factual disputes. Rather than continue the fight, the parties settled.

What does *Jordan v. St. Johns County* mean for St. Augustine? In addition to illustrating the likelihood of litigation arising from ad hoc deferrals or moratoria on maintenance for key roads and infrastructure, it also serves to highlight the value of addressing issues like prohibitively high maintenance costs in the context of the planning process. The *Jordan* decision took note of the fact that the county never formally voted to terminate road maintenance,[126] and hinted strongly to the parties that a formal decision to abandon the road would absolve the county of the duties on which the plaintiffs' claims were based.[127] Not only would addressing the issue legislatively have provided more legal cover, it would also been an opportunity to identify potential areas of compromise or settlement among the parties and to embody that compromise in a long-term plan for adapting (likely by eventually abandoning) both the road and barrier island.

Although *Jordan* dealt with a road, it is easy to imagine similar disputes over other types of infrastructure, such as electricity, stormwater, or wastewater. Thus St. Augustine might consider more than one application of some or all of the language in a model ordinance proposed in response to *Jordan* by Tom Ruppert and others—Florida attorneys who are expert in adaptation and land use.[128] That model ordinance creates a special category for roads like Old A1A: "any road categorized as 'environmentally compromised' under this ordinance shall be the subject of a

---

that protection. . . . more than the entire county budget for repair and maintenance of 800 miles of roads in the county.").

[123] *Jordan*, 63 So. 3d at 838.

[124] *Id.*

[125] *Id.* at 839.

[126] *Id.* at 838.

[127] *Id.*

[128] Thomas Ruppert et al., Environmentally Compromised Road Segments—A Model Ordinance, https://perma.cc/3RLM-DY7K (last visited Jan. 6, 2017).

requested design/maintenance exception."[129] It provides thorough definitions of key terms, such as "environmentally challenging location" and "environmentally compromised local road segment," which support decisions to reduce a given road segment's level of service based on the cost of its upkeep relative to that of other local road segments. By making the relative cost of upkeep (rather than simple dollar-amounts) the threshold for level of service reduction, the approach taken by the model ordinance creates flexibility for a local government confronted with both budget constraints and multiple acute adaptation issues.

[129] *Id.* at para. 1.

Appendix B: Methodology, Lessons Learned, & Recommendations

This appendix contains three sections related to Task 2 of the pilot phase of the Community Resiliency Initiative, performed by the Sabin Center for Climate Change Law at Columbia Law School ("Sabin Center"). The first section describes the Sabin Center's methodology for developing an Adaptation Plan for the City of St. Augustine. The second section describes lessons learned in the course of carrying out Task 2. The third section sets forth recommendations for the Florida Department of Economic Opportunity ("DEO") as it decides whether and how to shift from the pilot phase to fuller implementation of the Community Resiliency Initiative.

1. Methodology

While Dewberry Consultants LLC ("Dewberry") conducted Task 1, the Sabin Center conducted preliminary research into adaptation law and policy generally, adaptation law and policy as implemented by Florida localities, and Florida law related to comprehensive planning, climate change adaptation, takings, and municipal liability.

In advance of the October 2016 Preliminary Workshop, the Sabin Center reviewed Dewberry's Vulnerability Assessment for St. Augustine, as well as St. Augustine's comprehensive plan elements and various reports and documents that described its economic profile and recent hazard mitigation and/or disaster recovery efforts. This review informed the presentation the Sabin Center developed for the Preliminary Workshop, as well as its structuring of the discussion conducted at that Workshop.

The Sabin Center's presentation to Preliminary Workshop participants, which covered adaptation policy and relevant areas of Florida law, provided the basis for a facilitated discussion of potential responses to the vulnerabilities identified by Dewberry's Vulnerability Assessment and described in further detail by participants.

Following the Preliminary Workshop, the Sabin Center provided a summary document to participants (attached as Appendix B to the Adaptation Plan) and conducted further research into areas that local officials at the Preliminary Workshop and in subsequent communication characterized as pressing or especially important for St. Augustine. This research examined the academic literature and federal, state, and local governmental agency reports for discussions of those areas of consideration. It sought in particular to locate descriptions of how other jurisdictions had dealt with similar circumstances and issues. Using the original research and analysis conducted in advance of the Preliminary Workshop, details and insights collected from local officials during the Preliminary Workshop, and the articles and reports located through supplemental research, the Sabin Center developed St. Augustine's draft Adaptation Plan and sought local officials' feedback on that Plan.

2. Lessons Learned

The following observations and insights are based on the experience of gathering information about and developing an Adaptation Plan for St. Augustine. They could be useful for future adaptation planning efforts by other Florida localities and/or DEO.

Coordination among project team members. Project team members from DEO, Dewberry, and the Sabin Center each had distinct perspectives and unique resources available to them. Coordination among team members with legal, engineering, and policy expertise is important for aligning approaches so as to achieve the project's overarching goals.

Scoping. The scope of issues relevant to a locality's options and goals for adaptation can be extremely wide. Similarly, it is possible to delve in great depth into particular issues—whether they are programmatic, procedural, legal, engineering, or other. The Adaptation Plan reflects an iterative process, which began with a kickoff call, continued with the Preliminary Workshop and follow-up documentation of that Workshop's discussion, and wrapped up with feedback from St. Augustine on the draft Adaptation Plan. However, given the breadth and depth of possible approaches to adaptation, additional iterative steps might have been helpful to refine the scope of the Adaptation Plan. Additional iterative steps in subsequent efforts should include: two questionnaires, one sent before the Workshop to ask participants about their goals and expectations for the Workshop and the project as a whole, and another sent after the Workshop to ask participants about how they and/or their departments would like to make use of the Adaptation Plan.

Local officials want to better understand their options and constraints. St. Augustine officials were eager to learn about how Florida takings law could be expected to interact with the adoption of changes to a comprehensive plan element, of measures that apply to only part of the city, or of measures implemented by a departmental decision rather than formal regulatory process. They were also curious to know how localities elsewhere had responded to problems like those they were facing.

Gathering information. Plan elements, ordinances, and some locality-specific reports were publically available. However, details about important features of St. Augustine's adaptation profile, approach to historic preservation, and regulatory decision making processes could only be gathered from local officials. While the Preliminary Workshop served as a good means of identifying and collecting much of that information, future adaptation planning efforts would be aided by the collection of a standard set of documents relating to:

- Applications of legal and other criteria to historic preservation sites in St. Augustine;
- St. Augustine's budgeting process, particularly in relation to wastewater management systems;

- St. Augustine's recent experiences with federally-funded disaster planning, mitigation, and recovery; and
- Examples of adaptation planning reports or materials developed by other localities that St. Augustine officials have found to be informative and/or worth imitating in part or as a whole.

Hurricane Matthew validated Dewberry's Vulnerability Assessment. Local officials reported that Hurricane Matthew, which struck while Task 2 was underway, resulted in impacts that were highly consistent with those anticipated by Dewberry's Vulnerability Assessment. This alignment suggested part of an answer to local officials' questions about how to communicate with the public about the city's vulnerabilities: by recording in detail the adverse impacts of flooding and recalling those impacts during presentations on or discussions of options for adaptation, it is possible to draw on the public's recent direct experiences to convey the value of adapting to avoid similar experiences in the future.

Framing the comprehensive nature of adaptation planning. Some local officials seemed to understand the task of adaptation planning as a temporary intervention in the normal course of business, rather than the first instance of an approach to land use and capital investment planning that would involve permanent changes relative to past practice. As discussed in the Adaptation Plan, the most basic and important aspect of adaptation is to recognize that the coastlines and climate of the future will not only depart from those of the past but will continue to change—and so will require coastal localities to adapt continuously. This point should be conveyed early in the process and reinforced at each stage. Doing so will help participants to make the best possible use of the time with and access to experts, chiefly by shaping the Vulnerability Assessment and Adaptation Plan generated in the course of the project to be maximally useful for St. Augustine.

3. Recommendations for DEO

Localities are well positioned to identify the vulnerabilities to which adaptation is necessary. They are also uniquely well-informed about how best to set priorities for addressing those vulnerabilities. However, leadership from a statewide authority like DEO, the Department of Environmental Protection, or the Department of Transportation is critical to the success of adaptation to sea level rise in Florida. Statewide leadership can facilitate coordinated and potentially synergistic efforts among multiple localities. It can take pressure off of local officials who might otherwise face insurmountable political hurdles. And it can help make useful information,expertise, and funding accessible to those in need of it in a way that individual localities generally cannot do. This leadership role is even more critical now, as the federal government agencies that have served these centralizing roles to date are being directed away from further engagement. Consistent with these essential objectives, DEO should:

- Create an online database that shares the experiences of Florida localities already engaged in adaptation planning and implementation. In contrast to databases

maintained by the Georgetown Climate Center and the Climate Adaptation Knowledge Exchange,[130] a Florida-specific database would provide Florida localities with a manageable volume of resources, all of which reflect efforts to contend with similar challenges in the same legal and policy context. DEO might consider collaborating with the Southeast Florida Regional Climate Compact in this effort, as the Compact has already established a database of this sort.[131]

- Create a web portal that makes available technical information such as building codes, stormwater and wastewater equipment specifications, and disaster mitigation plans that have been shown to be especially effective in the face of rising seas and strengthening storms. Locating resources (or even just links to resources) like these in one place in an organized way would facilitate not just access but also comparisons of technical approaches across jurisdictions.

[130] Climate Adaptation Knowledge Exchange, http://www.cakex.org/; Georgetown Climate Center, State and Local Adaptation Plans, http://www.georgetownclimate.org/adaptation/plans.html.
[131] Southeast Florida Regional Climate Change Compact, RCAP Database, http://rcap.southeastfloridaclimatecompact.org/.

Appendix C: Preliminary Workshop Summary

Coastal Resiliency Initiative, Preliminary Workshop
St. Augustine, Florida | October 24, 2016

Summary

The Preliminary Workshop conducted on October 24, 2016 served several interwoven objectives, including:

1. Developing a common framework for understanding physical and policy options for adapting to sea level rise (SLR);
2. Characterizing the relationship between St. Augustine's historic district and buildings and its adaptation goals;
3. Characterizing particular adaptation issues in terms of their urgency, scale (physical and budgetary), relevance to particular constituencies, and ease or difficulty of address;
4. Identifying strategies suitable for addressing particular adaptation issues.

This summary organizes items covered during the Workshop in terms of those four objectives. It also notes several preliminary decisions taken, based in part on discussion of those items.

Framework for policy options

Responses to vulnerabilities resulting from SLR involves either (1) protecting current land uses and patterns of activity in vulnerable areas (protect), (2) reducing vulnerabilities by modifying those uses and patterns (accommodate), or steering clear of vulnerabilities by (3) moving existing people and structures (retreat) or (4) deciding against development (avoid). Implementing these approaches cost-effectively involves steering private decisions, as well as grounding decisions about the location and design of infrastructure in the best available information about future circumstances—topography, weather, and fiscal constraints, among others. Imposing restrictions on development can create legal risk for a locality. So too can the use of infrastructure funding to encourage accommodation, avoidance, or retreat from vulnerable locations. However, legal risks will increasingly also attend failures to do so.

Relationship between historic elements and adaptation goals

Rising sea levels confront St. Augustine with an existential conundrum. The city is a tourist destination in large part because of its historic district's buildings and their surrounding streets, squares, and waterfront. Unfortunately, those buildings stand in the path of increasingly frequent and severe flooding, and their material components make them highly susceptible to flood damage. Furthermore, efforts to make the city's historic buildings less vulnerable by elevating or relocating them would unravel significant aspects of the city's historic fabric and would be difficult to accomplish besides, as those buildings are largely unsuitable for either elevation or complete removal to a different location. This dire situation is not likely to inspire enthusiastic action on the part of residents and council members in response to calls for prudent steps toward adaptation—specifically, accommodation measures in the near term and at least partial retreat in the longer term. Notably, sharply rising property values are

currently compounding this collision between enthusiasm for investing in St. Augustine as it is today and investing in adaptation.

Adaptation issues and responsive strategies

The Workshop's "structured discussion" segments considered adaptation issues and responsive strategies. The main issue areas covered were: stormwater and wastewater management; flood insurance and freeboard requirements; historic & archeological resources; roads and bridges; disaster recovery; and the related tasks of budgeting, maintaining revenues, and justifying adaptation planning measures to elected officials and the public. The following table, which is organized by issue area, lists key points from the participants' discussion. It is not an exhaustive record of that discussion. The arrows in the right column indicate that the paragraph relates to the issue at left.

Issue area	*Issues identified*	*Responsive strategies discussed*
Stormwater & wastewater management	- Stormwater control systems are being outfitted with backflow prevention valves, but currently facilitate nuisance flooding	➔ Complete installation of backflow preventers Identify additional measures likely to be required in near-/medium-term
	- Many of the pipes that carry stormwater are old	➔ Explore installing bioswales etc. in public rights of way in addition to promoting low impact development by imposing a stormwater utility fee
	- Adverse impacts of SLR owing to current stormwater management system are most acutely felt by private property owners whose lawns are killed at least once per year by saltwater inundation	➔ Armoring the WWTP would reduce its vulnerability for while, but would damage the adjacent marsh; participants also discussed what would be required to plan for the relocation of the WWTP inland—an expensive and unwelcome prospect
	- The wastewater treatment plant is highly vulnerable to flooding and coastal storm events; its remaining useful life would be 30-50 years but for SLR; it is located adjacent to marshlands	➔ The city will acquire mobile pumps and harden system elements, such as the pumps whose electrical panels shorted out amid flooding; here again, participants stated that the
	- The wastewater management system more generally is also vulnerable: flooding incidental	

	to Hurricane Matthew inundated several wastewater pumps, shorting out their electric panels and making it impossible to operate them even after mobile generators were brought to supply backup power	expense, disruption, and fatal implication of relocating wastewater system elements made such a step unwelcome
Flood insurance and freeboard	- FEMA's proposed revision to the city's flood insurance rate maps (FIRMs) would *reduce* the extent of flood zones and thereby undermine the existing base flood elevation (BFE) requirements that have caused numerous property owners to elevate their residences or businesses	➔ Consider requesting reconsideration by FEMA. FIRM mapping builds on data from randomly selected past flood events; reconsideration can therefore easily prompt revision/correction to inappropriately rosy maps
	- Flooding incidental to Hurricane Matthew reached to precisely the levels predicted by existing FIRMs and related BFE requirements	➔ Push ahead with imposition of freeboard and consider requiring more than 1' Collect elevation certificates to support changes to freeboard requirement, Community Rating System
Historic & archeological resources	- Flooding incidental to Hurricane Matthew did significant damage to historic interiors in particular; several building owners have sought permission to gut their buildings and replace historical interiors; more post-Matthew requests for full or partial demolition are expected	➔ Explore options for restricting and/or steering rebuilding Examine opportunities for buyouts, downzoning
	- There is general recognition that historic buildings – and character of the historic district – are vulnerable and will only become more so	➔ The public must be involved in the process of prioritizing buildings (or facades) to save using protective and/or retreat measures, as well as in determining how much to spend on doing so, and when to implement those measures

	- Numerous archaeological sites will be inundated and thereby compromised for study	➔ Two types of decisions required: (1) which sites to excavate quickly, and (2) whether and how much to attempt the digital mapping and recording of information, including at sites that will not be fully excavated
Roads, bridges	- Several roads are failing due to age and also to repeated inundation	➔ Consider revising approach to budgeting that captures added costs of keeping up roads amid flooding (this will support specification of the "costs" side of a cost-benefit analysis that examines whether to discontinue maintaining a given road
	- Most thoroughfares and bridges are state owned and the state has made decisions about their design and upkeep that reflect no consideration for sea level rise	➔ Raise concerns with the state about their design decisions; propose alternatives, framing issue in cost terms
	- City council is currently engaged in an effort to promote pedestrian and bicycle access	➔ Look for ways to integrate mobility and flood control priorities, such as bioswales in the ROW or permeable pavements in locations beyond Flagler campus
Disaster recovery	- Flood waters amid Hurricane Matthew reached predicted levels	➔ Hurricane Matthew and the process of recovering from it provide an opportunity to engage the public about the reasons for adaptation and what adaptation will require
	- Wastewater system was impaired and overwhelmed, and now requires substantial repair	➔ Matthew is also a source of data about costs of restoring buildings and assets that are not resilient; capturing those data can support restrictions and requirements that avoid similar future costs; in relation to the WWTP, such data should inform cost and timing components of plans to repair vs. decommission the existing plant

		➔ Identify properties that could be or become targets for living shorelines, whether in collaboration with property owner or through buyout
	- Flooding amid Matthew was especially pronounced in predictable areas	
		➔ Use combo of Matthew and SB 1094 as prompting to draft redevelopment component of coastal management element Use restrictions to make up (somewhat at least) for changes to flood maps
	- City currently has no ordinance that directly addresses post-disaster redevelopment	
	- FEMA seems to want plans that restore rather than plans that improve resiliency (HMGP grant requirements require post-disaster restoration of pre-disaster conditions)	➔ Query FEMA re basis for this preference; ask about degree of flexibility available, and note that relevant statutes don't require complete fidelity to pre-disaster conditions[1]
Justifying adaptation measures	- Costs of adaptation are daunting, in addition to adaptation itself entailing unwelcome changes	➔ Begin capturing costs of business as usual (BAU) for use as a baseline; likely examples are road maintenance and repair/restoration of wastewater system; Build objective triggers, such as Mean High High Water levels, into planning elements so that difficult steps follow from circumstance and not from the judgment call made by a given person or office
	- Real estate prices are currently rising	➔ Capture the costs to private property owners and public budgets from Matthew, nuisance flooding, e.g., by surveying property owners for annual spending on lawn care and replacement, comparing damage in St. Augustine with damage in St. Johns county (where tighter coastal development restrictions apply)

[1] See Gundlach & Jones (2016), *available at* http://wordpress.ei.columbia.edu/climate-change-law/files/2016/06/Gundlach-and-Jones-2016-04-Climate-Change-Integration-in-HUD-Program.pdf.

- How to choose what to call an Adaptation Action Area?	➔ Explain the introduction of Adaptation Action Areas (or just one large Area) as serving several purposes, including some that narrowly relevant and some that are more general—and so will allow flexibility to respond to changing physical or political circumstances by tightening restrictions on (re)development in the AAA
- Bert Harris Act threatens restrictions on development	➔ Recognize that key language is "inordinate burden" and make the "burden" both data-based and standard for all similarly situated property owners

Decisions

- Should the work product submitted to St. Augustine be a free-standing document that identifies and analyzes a range of adaptation options? or should it be broken into components intended for specific uses in some planning Elements but not others?
  Preliminary answer: freestanding document.
- How should priorities be set for choosing among adaptation strategies?
  Preliminary answer: selection criteria include feasibility, salience for the public, urgency, cost.
- What adaptation issues, options and strategies should take priority?
  Preliminary answer: Formulation of an approach to decisions about how to respond as historic resources in vulnerable areas come under increasing threat. Also, wastewater management system planning and restrictions on redevelopment with an eye to (i) more cost-effective disaster recovery and (ii) lower maintenance costs.
- Are legislative changes necessary to enable or support preferred strategies?
  Preliminary answer: Legislative approval from the City Council will be necessary to implement some but not all strategies. No new state-level legislation seems to be required.