PLANNING FOR SEA-LEVEL RISE: A GUIDE FOR MANAGERS, OWNERS AND REGULATORS OF WATER-DEPENDENT INFRASTRUCTURE

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I. Introduction

The purpose of this paper is to serve as a guidance document regarding the effects of sea level rise on water-dependent infrastructure in Florida, which is of benefit to regulators and managers of water-dependent infrastructure. Generally, water-dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent upon a waterfront location.

According to the Intergovernmental Panel on Climate Change (IPCC), a widely accepted source within the scientific and policy-making communities, “due to sea level rise [projections] throughout the 21st century and beyond, coastal systems and low-lying areas will increasingly experience adverse impacts such as submergence, coastal flooding, and coastal erosion” among other sea level rise related effects.1 Projected sea level rise is a particularly important issue in the state of Florida due to its abundance of susceptible coastal and low-lying areas, in addition to its heavily coastal-oriented economy. Florida contains 2,276 miles of tidal shoreline and 2,100 miles of canals.2

The Florida Ocean Alliance reports that “Florida’s coastal counties contributed over $584 billion in gross regional product to Florida’s economy in 2010, or 79% of the state’s economy.”3 Of that figure, $35 billion is a direct contribution from the ocean economy.4 That economic activity directly produces 228,000 jobs and is indirectly responsible for producing at least 212,000 more.5 Nearly two-thirds of these jobs are in the tourism industry.6 The majority of the remainder are in ocean transportation.7 This financial impact to the state is so great, about five percent of Florida’s gross domestic product is attributable to Florida’s ocean resources.8

Often considered responses to sea level rise are protection, accommodation and retreat. The National Academy of Engineering and National Research Council highlighted the limitations of protection when they jointly declared, “the risks of inundation and flooding can never be fully eliminated by protective structures no matter how large or sturdy those structures may be.”9 In some cases, that reality makes long-term retreat from the coast the best option. However, very often “shoreline protective measures may be necessary due to the substantial existing investment

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1 INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY- SUMMARY FOR POLICYMAKERS 17 (2014).
3 FLORIDA OCEAN ALLIANCE, FLORIDA’S OCEANS AND COASTS: AN ECONOMIC AND CLUSTER ANALYSIS 1 (May 2013).
4 Id. at 2.
5 Id. at 1.
6 Id. at 2.
7 Id.
8 Id. at 1.
9 NATIONAL ACADEMY OF ENGINEERING AND NATIONAL RESEARCH COUNCIL, THE NEW ORLEANS HURRICANE PROTECTION SYSTEM, ASSESSING PRE-KATRINA VULNERABILITY AND IMPROVING MITIGATION PREPAREDNESS (2009); See also UNITED STATES ENVIRONMENTAL PROTECTION AGENCY, SYNTHESIS OF ADAPTATION OPTIONS FOR COASTAL AREAS 12 (2009) (suggesting governments should prohibit hard armoring or replace it with living shorelines to all for shoreline migration.)
and lack of feasible or economically viable alternatives.”

This precise situation is inherent to water dependent infrastructure. By its nature, water dependent infrastructure cannot be relocated. Therefore, this infrastructure is unique in its need to accommodate and adapt to sea level rise.

Therefore, the potential harms of sea level rise on Florida’s coastal communities will particularly affect those who own, plan, and regulate water-dependent infrastructure. Specific harms may include more severe beach erosion, bringing the sea closer to or covering existing infrastructure, increased flooding or inundation of low-lying areas housing infrastructure, and physical damage to and weakening of public and private property and infrastructure, largely due to exposure to salt water. In response to this threat, decision makers are highly encouraged to evaluate all feasible engineering and adaptation options and choose the combination that optimally provides for safe continuation of human use, keeping in mind environmental quality.

Further, given that capital infrastructure is developed and maintained with a relatively long life cycle, planning for future changes in sea level rise is timely now. “[D]evelopment decisions that are being made today are committing public and private capital to land use patterns and associated infrastructure and facilities with design lives that reach well into the period of time when the impacts of sea level rise will be felt.” In fact, although the State of Florida’s infrastructure was constructed to last at least seventy-five years, much of the design criteria have already been exceeded by sea level rise projections, and at least some prominent figures in the field of planning have suggested that “virtually none of Florida’s infrastructure was built to accommodate significant sea-level rise, and much of the current infrastructure of coastal Florida will need to be replaced or improved as sea level rises.” A prudent decision maker will use decision criterion that will support selection of a plan that will be successful over a wide range of potential scenarios. Where possible, an adaptive management approach that collects information about a system is recommended because it allows decisions to be made sequentially so that new information can be addressed while moving forward.

This document comprises four parts. First, a comprehensive review of existing literature addresses the impacts of, and policy responses to, sea level rise as it affects water-dependent coastal infrastructure, including ports, working waterfronts, and navigation channels. Second, a

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10 N.Y. STATE SEA LEVEL RISE TASK FORCE, REPORT TO THE LEGISLATURE 36 (2010).
12 N.Y. STATE SEA LEVEL RISE TASK FORCE, REPORT TO THE LEGISLATURE 36 (2010).
15 THE FLORIDA OCEANS AND COASTAL COUNCIL, CLIMATE CHANGE AND SEA-LEVEL RISE IN FLORIDA AN UPDATE OF THE EFFECTS OF CLIMATE CHANGE IN FLORIDA’S OCEAN AND COASTAL RESOURCES vi (2010).
17 Id.
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review of the legal and policy planning framework for incorporating sea level rise into water-dependent infrastructure planning decisions discusses the regulatory environment at the federal and state levels. Third, a discussion of three case studies which provide examples of sea level rise being incorporated into policy planning for water-dependent infrastructure. Finally, the appendices to this document are results of semi-structured interviews with planners, port officials, water-dependent businesses, and other interested professionals to gauge the extent to which sea level rise has been taken into account over selected planning horizons.

II. Review of existing literature

Existing literature related to sea level rise adaption by managers of water dependent infrastructure generally relates to the planning responses by ports and by local governments. Notably lacking from the literature are discussions related to adapting working waterfronts and inland navigation channels to sea level rise. Literature related to working waterfronts and inland navigation channels is apparently lacking because they are heterogeneous and less visible. In contrast, ports are relatively homogenous and are more economically significant.

Literature related to local governments is plentiful and the experience of local governments in planning for sea level rise is particularly pertinent to the managers of water dependent infrastructure for two reasons. One, local governments are largely in the vanguard in regulating a response to sea level rise. Two, local governments in coastal communities are typically the owners of water dependent infrastructure themselves. This literature review examines primary, in addition to secondary sources, where primary sources better describe an owner of water dependent infrastructure’s efforts to adapt water dependent infrastructure to sea level rise.

A. Literature related to ports

Planning for Climate Change Impacts at U.S. Ports is a 2008 report by the United States Environmental Protection Agency (EPA) which describes many potential issues facing ports as a result of sea level rise. Identified issues include navigability problems, like bridge clearance, infrastructure damage from inundation and higher storm surges and insurance premium hikes based on the increased infrastructure risks. The report suggests ports should consider sea level rise when building new, or improving existing, infrastructure.

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18 See e.g., FLORIDA CLIMATE INSTITUTE, PORTS AND NAVIGATIONAL CHANNELS WORKING GROUP, SURVEY-ADAPTATION OF PORTS TO THE IMPACTS OF CLIMATE CHANGE (providing case studies in and outside of Florida on port sea level rise planning).
19 See, DAVID NEWELL, ET AL. DISTRIBUTED TECHNOLOGICAL TOOLS FOR GLOBAL SEA LEVEL RISE RESPONSE PLANNING 4 (updated May 2011).
20 See, Id.
21 See, UNITED STATES ENVIRONMENTAL PROTECTION AGENCY [USEPA], PLANNING FOR CLIMATE CHANGE IMPACTS AT U.S. PORTS (2008).
22 Id. at 4.
23 Id. at 5.
24 Id. at 6.
25 Id. at 4.
Despite these pending issues, a survey of the world’s port authorities, conducted in cooperation with International Association of Ports and Harbors and the American Association of Port Authorities, found that the majority of ports are not yet implementing sea level rise adaptation strategies. A 2012 survey of 93 international ports indicated that while 81% percent of the port directors recognized that the impacts of sea level rise need to be addressed by the port community, only 31% felt sufficiently informed about how sea level rise would affect their port.

According to the EPA study, a major reason ports were not aggressively planning for sea level rise in 2008 is because sea level rise impact projections contain uncertainties. These uncertainties inhibit the level of consideration given to sea level rise in each port’s planning process. The report notes:

The [Intergovernmental Panel on Climate Change’s] most recent forecast of sea level rise is provided for a date 80-90 years in the future. In contrast, the typical lifespan of major port infrastructure, including docks and port terminals, is around 40-50 years. Ports thus have little incentive to plan now for projected future climate change impacts. Existing infrastructure, and perhaps also the next generation of infrastructure, will expire before the [Intergovernmental Panel on Climate Change’s] forecast point arrives.

The EPA report makes five recommendations for better addressing sea level rise in port decision making.

First, ports could consider incorporating climate change forecasts into short and long term plans, to the extent possible… Second, ports could work to keep abreast of developments in climate science and climate change adaptation… Third, ports could consider reaching out to other agencies, including local, regional, and statewide bodies, to form alliances to address climate change adaptation… Fourth, ports could also study the actions that other ports are taking to prepare for climate change, both within and beyond their immediate regions… Finally, a national study focused on ports’ risk from climate change and their adaptation options could be useful.

Several of these recommendations—including incorporating sea level rise forecasts into decision making—are reinforced by the case studies presented later in this paper.

28 UNITED STATES ENVIRONMENTAL PROTECTION AGENCY [USEPA], PLANNING FOR CLIMATE CHANGE IMPACTS AT U.S. PORTS 7 (2008).
29 Id.
30 Id. at 10-13.
B. Literature related to local and state governments

Like port planning, local government planning for sea level rise is not uniformly robust. “Most cities are in the beginning steps of adaptation planning, so many actions are formative, such as meetings and online research.” However, several communities are aggressively responding to sea level rise.

1. New York City

New York City is at the forefront considering sea level rise in development decisions. The city adopted The New York City Waterfront Revitalization Program in 1982, establishing the city’s policies for development and use of its waterfront. In December of 2014, the city approved significant revisions to the waterfront revitalization program. The revision explicitly addresses one of the major obstacles to planners’ efforts to design adaptation policies: the uncertainty inherent in long-term sea level rise projections. To confront such uncertainty, the city adopted this policy directing all planning and design projects in the city’s coastal zone to integrate the city’s latest sea level rise projections.

The appropriate techniques for a given project depend on case-by-case considerations, including such factors as the project’s lifespan, the costs, benefits and feasibility of incorporating a technique, and the potential adverse or positive effects of the techniques on ecological health, public health, urban design, economic activity, and public space. To the extent that potential techniques are identified but not incorporated, an explanation shall be provided as to why incorporating such techniques are not appropriate or practicable for the given project, or how the project may be adapted to incorporate such measures in the future.

The policy requires proposed projects to identify potential vulnerabilities to sea level rise and to incorporate design features that reduce perceived vulnerabilities not only to the proposed project, but also to existing structures and uses. To address the recognized uncertainty inherent in long-term sea level rise projections, the policy directs planners to use the “furthest projection” when the project’s usable lifespan exceeds the timeframe of any available projections.

34 N.Y.C. DEP’T OF PLANNING, THE NEW YORK CITY WATERFRONT REVITALIZATION PROGRAM: PART II: THE POLICIES 40, (2012). [As of the drafting of this document, the revisions were pending review with the New York Secretary of State before the NYS Department of State will request incorporation into the States’ Coastal Management Program].
35 Id. at 43.
36 Id. at 43-44.
37 Id. at 44.
38 Id. at 43.
2. State of Maryland

In response to a state executive order in 2014, the Maryland Commission on Climate Change, Adaptation, and Response Working Group issued infrastructure and siting guidelines prohibiting state structures from being developed or redeveloped within 50-year sea level rise projection areas. However, this recommended prohibition is not absolute as the guidelines make an explicit exception for water-dependent uses that can be demonstrated to have been designed to increase resiliency to future impacts. This policy is commendable for steering development away from hazardous coastal areas, while still recognizing that exceptions must be made for those uses that require a water dependent location.

3. Miscellaneous local government approaches

The report Adaptation Tool Kit: Sea Level Rise and Coastal Land Use is a particularly comprehensive review of the options available to governments in dealing with sea level rise. This report presents eighteen different land-use tools that local governments could use to preemptively respond to the threats posed by sea level rise. The report’s focus is on tools that could be used to adapt coastal development and infrastructure. The report also analyzes the advantages and disadvantages of using each tool based on five criteria: economic, environmental, social, administrative, and legal. Further, the document identifies the powers of government used to implement the tool (e.g., regulatory or spending powers), how effective the tool would be in furthering a community’s chosen coastal adaptation goal (e.g., protection or retreat) and the utility of the tool given the existing or potential land uses to which the tool is applied (e.g., critical infrastructure, developed land, developable land, or undevelopable land). Finally, the document contains examples of states’ implementing the tools from throughout the United States.

Similar to the literature related to ports, the available literature related to local governments emphasizes the importance of incorporating sea level rise projections into local government decision making. While available global and national sea level rise projections are helpful, more narrowly focused projections are much more desirable as they allow the decision maker to plan more precisely. Currently, governments at all levels are undertaking vulnerability assessments to garner data on this front in order to facilitate their adaptation planning efforts. The Southeast Regional Climate Change Compact Vulnerability Assessment is a noteworthy example of communities cooperating to gather projected sea level rise data to facilitate their community

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39 STATE OF MARYLAND, CLIMATE CHANGE AND COAST SMART CONSTRUCTION INFRASTRUCTURE SITING AND DESIGN GUIDELINES 8 (2014).
40 Id.
41 See, JESSICA GRANNIS, GEORGETOWN CLIMATE CTR., ADAPTATION TOOL KIT: SEA-LEVEL RISE AND COASTAL LAND USE (2011).
42 Id. at 1.
43 Id. at 10.
44 Id. at 12-15.
45 See, Id.
resiliency planning.\textsuperscript{47} That assessment contains sea level rise projections for the region as a whole and for all member counties individually. It further breaks down each county’s water dependent infrastructure and utilizes the sea level rise projections to assess the risks faced by those particular features.\textsuperscript{48}

III. Review of legal and policy planning framework

A. Federal Law

Many federal laws and policies implement policies or statutes that influence sea level rise planning by owners and managers of water dependent infrastructure. This discussion of those rules is organized by the agencies that implement relevant programs.

1. United States Army Corps of Engineers

The United States Army Corps of Engineers (USACE) has authority under the federal Clean Water Act over general dredge and fill permits in waters of the United States, including wetlands.\textsuperscript{49} Accordingly, a decision maker must account for the Clean Water Act’s mandates, and accompanying USACE regulations when engaging in any infrastructure planning which involves construction in “navigable waters,” such as the deepening of navigation channels or the construction of a seawall.\textsuperscript{50}

Specifically contemplating sea level rise, the USACE has adopted regulations giving “guidance for incorporating the direct and indirect physical effects of projected future sea level change across the project life cycle in managing, planning, engineering, designing, constructing, operating, and maintaining USACE projects and systems of projects.”\textsuperscript{51} The regulation provides both a methodology and a procedure for determining a range of sea level rise estimates based on the local historic sea level rise rate, the construction (base) year of the project, and the design life of the project.\textsuperscript{52} The regulation requires three estimates: a baseline estimate representing the minimum estimated sea level change (i.e., “low” rate), an “intermediate” rate, and a “high” rate representing the maximum estimated sea level change.\textsuperscript{53} To aid its agents in complying with the regulation, the USACE issued Engineering Technical Letter 1100-2-1, which provides in-depth detail on how to incorporate sea-level change into project planning.\textsuperscript{54}

\textsuperscript{47} Analysis of the Vulnerability of Southeast Florida to Sea Level Rise, SRCCC Inundation Mapping and Vulnerability Assessment Workgroup (Aug 2012).
\textsuperscript{48} Id.
\textsuperscript{50} 33 U.S.C. § 1344 (2014).
\textsuperscript{51} U.S. Army Corps. of Engineers [USACE], Engineering Regulation No. 1100-2-8162, 1 (2013).
\textsuperscript{52} Id. at 2-3.
\textsuperscript{53} Id.
\textsuperscript{54} U.S. Army Corps. of Engineers [USACE], Engineering Technical Letter No. 1100-2-1 (2014).
2. United States Coast Guard

The United States Coast Guard (USCG) is a federal agency with broad law enforcement authority on waters under the jurisdiction of the United States.55 In its 2014 Western Hemisphere Strategy, the USCG identifies sea level rise as a global trend affecting the USCG’s strategic priorities.56 “The health and livelihoods of … populations living in coastal regions will be negatively impacted by rising sea levels which can result in erosion of coasts [and] destruction of property.”57

The Seventh District of the USCG, based in Miami, Florida, “has authority over permitting, construction, reconstruction, and alteration of bridges across navigable waters of the United States within its geographic district.”58 In permitting bridges, the USCG considers bridge height to minimize conflict between land and water transportation modes.59 Further, the USCG considers projected sea level rise in permit issuance.60 The USCG’s mandate to maintain and ensure that bridges remain capable of sufficient and safe travel for vessels expected to use the waterway, may affect owners and managers of affected bridges.

Research conducted by the Arthur R. Marshall Foundation for the Everglades (Marshall Foundation) has pointed out that

When the lifespan of a bridge is reached, or a bridge otherwise needs to be rebuilt, it is more efficient to construct the bridges in accordance with worst case scenario sea level rise (e.g. 6.6 feet by 2100) in mind, rather than building a bridge to insufficient standards and then requiring repair and clearance adjustments when water levels become an immediate and dangerous issue.61

The Marshall Foundation recommends the USCG more proactively address sea level rise in its bridge permitting process.62

3. United States Environmental Protection Agency

The United States’ Environmental Protection Agency (EPA) states that it is “taking a number of common-sense steps to address the challenge of climate change,”63 but there are neither readily available existing rules and regulations regarding sea level rise in particular, nor rules regarding the required response of water dependent infrastructure specifically.

55 U.S. Coast Guard [USCG] Publication available at http://www.uscg.mil/international/affairs/publications/mmscode/english/chap3.htm (“The U.S. Coast Guard is authorized to enforce, or assist in the enforcement of, all U.S. Federal laws applicable on, over, and under the high seas and waters subject to the jurisdiction of the United States.”).
56 See, UNITED STATES COAST GUARD, WESTERN HEMISPHERE STRATEGY 13 AND 16 (SEPTEMBER 2014).
57 Id. at 17.
58 MARY CRIDER, ET AL., SEA LEVEL RISE AND NAVIGABLE WATERWAYS 3 (2014).
60 Id.
61 MARY CRIDER, ET AL., SEA LEVEL RISE AND NAVIGABLE WATERWAYS 6 (2014).
62 Id. at 5.
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The EPA has commented that likely consequences of sea level rise may include forced raising of infrastructure—especially harbor infrastructure and ports—to prevent flooding, avoid environmental mitigation projects, and mitigate storm events and precipitation which can damage bridges, wharfs, and piers, terminal buildings, ships, and cargo.\(^{64}\) In a somewhat dated 2008 report, the agency said

> United States ports will almost certainly experience some or all of [these] impacts from climate change, but appropriate adaptation responses are unknown. Ports’ typical planning processes are ill-equipped to respond to the high levels of uncertainty associated with climate change impacts, the timescales of climate change, and the geographical scale of climate change.\(^{65}\)

Furthermore, “many ports rely on federal resources, including data from the [FEMA], the [NOAA], and the [USACE], to determine their engineering standards” and possibly to engage in infrastructure reformulation and improvement.\(^{66}\) The constraints of potential federal funding opportunities and sea level rise suggest that planners and owners of water-dependent infrastructure may be best served by working more closely with these agencies in the future.

4. National Oceanic and Atmospheric Administration

A branch of the United States Department of Commerce, the National Oceanic and Atmospheric Administration (NOAA) uses a science based approach to understand climate, weather, oceans and coasts and to regulate for the conservation of those resources.\(^{67}\) The administration implements both the federal Coastal Zone Management Act (CZMA) and Coastal and Estuarine Land Conservation Programs which may create constraints or opportunities for planning for sea level rise affecting water-dependent infrastructure.

Jointly with the EPA, NOAA implements the federal CZMA which seeks to address conflict between protection and use of coastal zones and encourages coastal states to create federally-approved coastal management programs.\(^{68}\) Participation by each state in the CZMA is voluntary, but the state may receive federal financial assistance for implementing its own coastal management program if NOAA approves the program.\(^{69}\) “The management programs [are] to assist states to achieve wise use of the land and water resources of the coastal zone, giving full

\(^{64}\) U.S. ENVIRONMENTAL PROTECTION AGENCY, PLANNING FOR CLIMATE CHANGE IMPACTS AT U. S PORTS 4, 5 (2008).

\(^{65}\) U.S. ENVIRONMENTAL PROTECTION AGENCY, PLANNING FOR CLIMATE CHANGE IMPACTS AT U. S PORTS 7 (2008).

\(^{66}\) Id. at 8.


\(^{68}\) FLORIDA COASTAL OFFICE, FLORIDA COASTAL MANAGEMENT PROGRAM GUIDE: A GUIDE TO THE FEDERALLY APPROVED COASTAL MANAGEMENT PROGRAM 4 (June 25, 2014); see also 16 U.S.C. § 1451 et seq. (2014).

\(^{69}\) United States Environmental Protection Agency, Coastal Zone Management Act (CZMA) http://www.epa.gov/agriculture/lzma.html (last visited May 19, 2015).
consideration to ecological, economic, cultural, historic, and aesthetic values,” and require the state program to meet certain elements.\textsuperscript{71}

Planning constraints under the CZMA may include the fact that each state’s plan must include a description of its coastal areas, which sea level rise could change. Each state coastal management plan must describe the boundaries of the state’s coastal zone, coastal land, water and natural resources that have a direct and significant impact on coastal waters.\textsuperscript{72} The boundaries of these lands are ambulatory and stand to be affected by sea level change. Planners and owners of water-dependent infrastructure should be aware that this federal act could require different compliance in the future than it does currently.

5. Executive Order

The late 2014 Executive Order 13653, “Preparing the United States for the Impacts of Climate Change,” states

\begin{quote}
The impacts of climate change—including … sea-level rise—are already affecting communities, natural resources, ecosystems, economies, and public health across the Nation. … Managing these risks requires deliberate preparation, close cooperation, and coordinated planning by the Federal Government, as well as by stakeholders, to facilitate Federal, State, local, tribal, private-sector, and nonprofit-sector efforts to improve climate preparedness and resilience; help safeguard our economy, infrastructure, environment, and natural resources; and provide for the continuity of executive department and agency (agency) operations, services, and programs.\textsuperscript{73}
\end{quote}

The Order has four task areas which include modernization of U.S. Federal Programs to support climate-resilient investments, management of lands and water for climate change resilience, providing information, data, and tools for planning preparation, and planning for climate change related risk such as sea level rise.\textsuperscript{74}

B. Florida Law

The following subsections describe Florida laws which may affect development and maintenance of water-dependent infrastructure in light of sea level rise.


\textsuperscript{71} Florida implemented its own coastal management program in 1978 and received approval through NOAA in 1981. Id. at 6.

\textsuperscript{72} Id., at pages 4-5, 23.

\textsuperscript{73} Exec. Order No 13,653, 78 Fed. Reg. 66,819 (Nov. 6, 2013).

\textsuperscript{74} Id.
1. Beach and Shore Preservation and Coastal Zone Protection

The coastal zone is the most stringently regulated zone in the state of Florida. The Florida legislature has long recognized that the natural beaches and barrier dunes of the coast represent a significant natural resource of the state, and “it is in the public interest to preserve and protect them from imprudent construction which can jeopardize the stability of the beach-dune system, accelerate erosion, provide inadequate protection to upland structures, endanger adjacent properties, or interfere with public beach access.” Because water dependent infrastructure is always located on the water, and sometimes on a beach, regulations affecting coastal construction implicate the siting and maintenance of water dependent infrastructure.

In 1961, the Legislature created the Beach and Shore Preservation Act (BSPA) which the Florida Department of Environmental Protection (FDEP) Beaches, Inlets, and Ports Program implements. The BSPA comprises two principle parts: regulation of construction on beaches and establishment of beach and shore preservation districts.

First, the BSPA requires the creation of coastal construction control lines (CCCL) on a county basis. Coastal construction control lines are computed based on modeling of expected flooding from a potential 100-year storm surge. A comprehensive engineering and topographic study precedes every CCCL delineation. Coastal building seaward of the point at which the line is drawn is subject to strict rules and regulations, if allowed at all.

The thirty-year erosion lines, unlike the CCCL, are fluid and determined by the FDEP on a case by case basis. Because the thirty-year erosion lines are subjective, developers, planners, and landowners may receive conflicting results about where they may build landward of this line. With rising sea level, both coastal construction control lines and thirty-year erosion lines are likely to shift, and should likely be considered when planning for land uses directly abutting the coast or these regulatory lines. Water-dependent uses, by their nature, would be especially affected.

77 FLORIDA COASTAL OFFICE, FLORIDA COASTAL MANAGEMENT PROGRAM GUIDE: A GUIDE TO THE FEDERALLY APPROVED COASTAL MANAGEMENT PROGRAM 34 (June 25, 2014).
79 FLORIDA COASTAL OFFICE, FLORIDA COASTAL MANAGEMENT PROGRAM GUIDE: A GUIDE TO THE FEDERALLY APPROVED COASTAL MANAGEMENT PROGRAM 34 (June 25, 2014).
80 DAVID BUSH ET AL., LIVING WITH FLORIDA’S ATLANTIC BEACHES: COASTAL HAZARDS FROM AMELIA ISLAND TO KEY 287 (2004).
81 DAVID BUSH ET AL., LIVING WITH FLORIDA’S ATLANTIC BEACHES: COASTAL HAZARDS FROM AMELIA ISLAND TO KEY 287 (2004).
Second, the Coastal Zone Protection Act of 1985 (CZPA), is codified within the same chapter as the BSPA and sets additional requirements for building in the coastal building zone. Under the CZPA, the “coastal building zone,” is defined as “the area from the seasonal high-water line landward to a line 1,500 feet landward from the coastal construction control line…and not included…as part of the land area seaward of the most landward velocity zone (V-zone) line as established by the [FEMA] and shown on flood insurance rate maps.” This zone was created in order to protect and preserve the coast as a valuable resource. The CZPA provides requirements for three classifications of structures: major structures, minor structures, and non-habitable structures, all regulated to produce the minimum adverse impact on the beach and dune system, but does not mention nor take any account of sea level rise.

2. Comprehensive planning in the State of Florida

The Florida Constitution requires Florida to have a long range comprehensive plan. Comprehensive planning anticipates how the state and local governments will accommodate growth through the future use of land, necessary infrastructure and services and the protection of vital resources. The state and individual local governments have broad authority to draft comprehensive plans that establish the public policy preferences of residents and policy makers. Florida statutes further require the state comprehensive plan to address water dependent infrastructure:

In recognition of the state’s commitment to deepwater ports, the state comprehensive plan must include goals, objectives, and policies that establish a statewide strategy for enhancement of existing deepwater ports, ensuring that priority is given to water-dependent land uses.

Further, the adopted state comprehensive plan requires giving priority in marine development to water-dependent uses over other uses.

Florida statutes require that each of Florida’s local governments adopt a comprehensive plan which is consistent with the state comprehensive plan. These local plans must be “based upon relevant and appropriate data” and “analysis,” to be valid according to Florida law. Although local governments have discretion over which professionally accepted sources of this information they choose to integrate into their comprehensive plans, at least one commentator

89 Comprehensive planning decisions are legislative and therefore subject to the deferential fairly debatable standard. Martin Cnty. v. Yusem, 690 So. 2d 1288, 1295 (Fla. 1997).
on the relationship between comprehensive planning and consideration of sea level rise, believes that this mandate for data-based planning means that communities must plan for sea level rise.\textsuperscript{95} That commentator, Richard Grosso says that “given the overwhelming bulk of the scientific data currently available related to sea level rise and climate change, any planning decisions that are not based upon such information will be legally deficient.”\textsuperscript{96}

Florida law specifically requires that comprehensive plans be organized by elements, or subject matter, and require plans to address several subjects explicitly.\textsuperscript{97} These include a future land use element, a coastal management element, a general sanitary sewer, solid waste, drainage, and potable water element, a conservation element, a housing element, an intergovernmental coordination elements, a transportation element, a capital improvements element, and other optional elements.\textsuperscript{98} Several of these elements are discussed here with connections between the statutory requirements and sea level rise identified.

\textit{i. Future Land Use Element}

The future land use element requires designation of proposed future general distribution, location, and extent of the uses of land within a community.\textsuperscript{99} In particular, the local comprehensive plan must be “based upon surveys, studies, and data regarding the area,” including any need for development, and shall include specific criteria to coordinate future land uses with the topography and soil conditions, and preserve recreational and commercial working waterfronts for water-dependent uses in coastal communities.\textsuperscript{100} Specific to Florida, criteria must be included in each local comprehensive plan to: encourage preservation of recreational and commercial working waterfronts for water-dependent uses in coastal communities.\textsuperscript{101} The future land use element of comprehensive planning is the “primary mechanism by which land use planning decisions impact mitigation and adaptation”\textsuperscript{102} and future land use planning could likely not be accomplished in a meaningful way without considering sea level rise.\textsuperscript{103}

\textit{ii. Coastal Management Element}

Certain local governments\textsuperscript{104} are required to include a coastal management element in their comprehensive plan.\textsuperscript{105} In general, “it is the intent of the Legislature that local government comprehensive plans restrict development activities where such activities would damage or destroy coastal resources, and that such plans protect human life and limit public expenditures in

\begin{itemize}
\item[95]\textit{See, Id.}
\item[96]\textit{Id.}
\item[97]\textit{Fla. Stat. § 163.3177 (2014).}
\item[98]\textit{Id.}
\item[99]\textit{Fla. Stat. § 163.3177(6)(a) (2014).}
\item[100]\textit{Id.}
\item[102]\textit{Fla. Stat. § 163.3177(6)(a)(3) (2014).}
\item[104]\textit{See, Id.}
\item[105]\textit{Fla. Stat. § 380.24 (2014).}
\item[106]\textit{Fla. Stat. § 163.3177(6)(g) (2014).}
\end{itemize}
areas that are subject to destruction by natural disaster.”

The coastal management element must be designed to meet several specific goals, including “[d]irect[ing] the orderly development, maintenance, and use of ports … to facilitate deepwater commercial navigation and other related activities.”

In 2005 and 2006 the Florida Legislature implemented requirements that local governments address working waterfront preservation in the coastal elements of the local comprehensive plan. Per the statute, coastal local governments must include a shoreline use component in the coastal management element of the comprehensive plan that:

identifies public access to beach and shoreline areas and addresses the need for water-dependent and water-related facilities, including marinas, along shoreline areas. Such component must include the strategies that will be used to preserve recreational and commercial working waterfronts.

In the 2015 regular session, the Florida Legislature adopted amendments to statutory requirements for coastal management elements, which await the Governor’s signature, to further require they include:

development and redevelopment principles, strategies, and engineering solutions that reduce the flood risk in coastal areas which results from high-tide events, storm surge, flash floods, stormwater runoff, and the related impacts of sea-level rise.

In addition to these several requirements for considering sea level rise, Florida statutes permit, “at the option of the local government, develop[ing] an adaptation action area designation for those low-lying coastal zones that are experiencing coastal flooding due to extreme high tides and storm surge and are vulnerable to the impacts of rising sea level.” The purpose of adopting such an adaptation action area would be “to address coastal hazards and potential impacts to sea level rise in a specific location by pursuing adaptation planning within the designated area and prioritizing funding for infrastructure improvements.”

**iii. Conservation Element**

City and county comprehensive plans must include a conservation element that addresses “the conservation, use, and protection of natural resources in the area.” The element must identify all waters of the area including rivers, bays, lakes, wetlands, estuarine marshes, ground waters,
springs, and floodplains known to have experienced certain environmental issues such as soil erosion, and host recreationally and commercially important fish or shellfish, wildlife, marine habitats, and vegetative communities. Due to the nature of these concerns and their inseparable relation to the ocean and therefore rising sea level, “these requirements...are powerful mandates to make land use decisions that are completely consistent with the current and future realities of climate change and sea level rise.” Further, “[p]olicies meeting these requirements, based upon community-specific data and analysis concerning climate and sea level rise impacts, would tend to allow only that development which, by its nature, has to be located along the coast or other vulnerable areas.” In other words, the required conservation element may limit development in sensitive coastal areas to water dependent infrastructure.

3. The Florida Coastal Management Program

The state of Florida adopted its own Coastal Management Act, six years following the federal Coastal Zone Management Act, that authorized the Florida Coastal Management Program. The FDEP’s Coastal Office is responsible for overseeing this program through which a network of agencies conduct federal consistency reviews to implement twenty-four separate statutes that “protect and enhance the state's natural, cultural and economic coastal resources.”

According to the Florida Coastal Management Program Guide, federal consistency reviews in Florida are mainly conducted during the processing of state permits. Federal Consistency “is the requirement that Federal actions that affect any land, water, or natural resource of a state’s coastal zone must be consistent with the enforceable policies of the state.” Consistency reviews must show compliance with federal law and are conducted for a variety of federal licenses or permits.

4. Executive actions

In July of 2007, then Governor Crist established the Florida Governor’s Action Team on Energy and Climate Change (Action Team) to assess and address the issues Florida will likely face as a result of climate change. Executive Order 07-128 placed the Secretary of the FDEP with primary responsibility over the Action Team, although four other state agencies were directed to provide support upon request of the Secretary of FDEP. The Governor directed the Action

116 Id.
119 FLORIDA COASTAL OFFICE, FLORIDA COASTAL MANAGEMENT PROGRAM GUIDE: A GUIDE TO THE FEDERALLY APPROVED COASTAL MANAGEMENT PROGRAM 9 (June 25, 2014).
120 Id.
121 Id.
123 Id. at 5.
Team to prepare the “Florida Energy and Climate Action Plan,” which was to comprise two reports, completed by October of 2008, that included strategies and policies for addressing climate change.\textsuperscript{124}

The Action Team appeared to be predominantly focused on addressing climate change through reducing the emissions of greenhouse gases statewide, given the fact the greenhouse gas emissions are understood to be a major contributor to climate change.\textsuperscript{125} However, the Action Team’s reports also included strategies and policies to specifically address the potential impacts of sea level rise on Florida’s economy and infrastructure.\textsuperscript{126} Particularly relevant to this document, the Phase II report recommended a climate change impact public awareness and education program. This program recommendation included a goal that by January of 2010, fifty percent or more of Floridians and Florida businesses will acknowledge the seriousness of climate change impacts, including sea level rise.\textsuperscript{127}

To further this program goal, the Action Team recommended developing a training program to educate professionals on “the need to incorporate adaptation to climate change as a basis for establishing design criteria for new infrastructure.”\textsuperscript{128} The Action Team further recognized local governments as “vital partners in addressing climate change” because of their “primary responsibility for land-use, development, and infrastructure planning.”\textsuperscript{129}

In 2009, Governor Crist, along with the Governors of North Carolina, South Carolina, and Georgia, signed the \textit{South Atlantic Alliance Partnership Agreement}, forming the Governor’s South Atlantic Alliance (Alliance).\textsuperscript{130} The Alliance is led by the four states in partnership with three federal co-lead agencies: NOAA, USEPA, and U.S. Geological Survey.\textsuperscript{131} A major impetus behind the formation of the Alliance was to create a means by which the four states could collaborate to address agreed upon regional “Priority Issue Areas.”\textsuperscript{132}

Notably, the Alliance recognized working waterfronts as one of these four identified Priority Issue Areas.\textsuperscript{133} In its Action Plan, the Alliance recognized that sustaining “robust waterfront cultural traditions, commerce, adequate access and use of public trust waters, and infrastructure” will require working waterfronts, including ports and navigational channels, to confront emerging issues, such as sea level rise.\textsuperscript{134} With this in mind, the Action Plan desires to “ensure [the] sustainable economic viability of working waterfronts while preserving traditional uses,

\begin{flushleft}
\textsuperscript{124} \textit{Id. at} 2-3.  \\
\textsuperscript{125} \textit{See, Id. (recognizing the creation of the Action Team for the purpose of developing a plan to meet statewide greenhouse gas emission reduction targets).}  \\
\textsuperscript{126} \textit{GOVERNOR’S ACTION TEAM ON ENERGY AND CLIMATE CHANGE, FLORIDA’S ENERGY & CLIMATE CHANGE ACTION PLAN: PHASE II, 35, (2008).}  \\
\textsuperscript{127} \textit{Id. at} 7-5; \textit{GOVERNOR’S ACTION TEAM ON ENERGY AND CLIMATE CHANGE, FLORIDA’S ENERGY & CLIMATE CHANGE ACTION PLAN PHASE I, 79, (2007) (defining “climate change impacts” to include sea level rise).}  \\
\textsuperscript{128} \textit{GOVERNOR’S ACTION TEAM ON ENERGY AND CLIMATE CHANGE, FLORIDA’S ENERGY & CLIMATE CHANGE ACTION PLAN: PHASE II, 8-7 (2008).}  \\
\textsuperscript{129} \textit{Id. at} 7-6.  \\
\textsuperscript{130} \textit{GOVERNOR’S SOUTH ATLANTIC ALLIANCE, ACTION PLAN 3 (2009).}  \\
\textsuperscript{131} \textit{Id.}  \\
\textsuperscript{132} \textit{Id.}  \\
\textsuperscript{133} \textit{Id. at} 4.  \\
\textsuperscript{134} \textit{Id. at} 7.
\end{flushleft}
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including national defense, by balancing suitable public, commercial, port, residential and environmental uses with best management practices."\(^{135}\)

5. Case Law

In *Jordan v. St. Johns County*, plaintiffs complained that St. Johns County failed to maintain Old A1A and thereby deprived them of reasonable access to their properties.\(^{136}\) The court found that the road was subject to “repeated damage from natural forces such as storms and erosion.”\(^{137}\) The Fifth District Court of Appeal in Florida held that a county has a duty to “reasonably maintain” a public road dedicated to public use.\(^{138}\) While the county does not have a duty to maintain the road in a particular manner, the court held that the county “must provide a reasonable level of maintenance that affords meaningful access, unless or until the county formally abandons the road.”\(^{139}\) This holding should provide local governments with incentive to incorporate SLR into their public infrastructure siting decisions in order to avoid the potentially exorbitant liability associated with maintaining infrastructure in high risk areas.

C. Florida local governments

The following county governments are Florida local governments who have taken some proactive measures to address sea level rise. They are discussed to provide examples of regulatory approaches to sea level rise being take by local governments in Florida.

1. Monroe County

As part of its comprehensive plan, Monroe County included a conservation and coastal management element. To comply with the statutory guidelines addressed above, the county adopted, in part, Goal 212: “Monroe County shall prioritize shoreline land uses and establish criteria for shoreline development in order to preserve and enhance coastal resources and to ensure the continued economic viability of the County.”\(^{140}\) In line with this goal, the county adopted two objectives pertinent to this guidance document. The first objective required the county to adopt and implement regulations that prioritize shoreline uses in the following order: water-dependent uses, water-related uses, and uses that are not dependent or related to shoreline access.\(^{141}\) The second objective required the county to adopt performance standards to minimize the impacts of shoreline development.\(^{142}\) This objective was followed with a policy that required the county to review the appropriateness of its coastal construction setbacks and the required consideration of whether the setbacks “protect structures from the effects of long-term sea level rise.”\(^{143}\) These objectives and policies address sea level rise planning, in line with the retreat

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\(^{135}\) *Id.* at 8.
\(^{136}\) *Jordan v. St. Johns County*, 63 So.3d 835, 836 (Fla.App. 5 Dist. 2011).
\(^{137}\) *Id.* at 837.
\(^{138}\) *Id.* at 838.
\(^{139}\) *Id.*
\(^{140}\) Monroe County Comprehensive Plan 2010, Conservation and Coastal Management Element, 3.2-78 (revised 2014).
\(^{141}\) *Id.*
\(^{142}\) *Id.*
\(^{143}\) *Id.*
strategy, by limiting the development in the most at risk areas to necessary development and ensuring that that development is prudently distanced from the coastline.

2. Miami Dade County

Miami Dade County’s coastal management element, does not mention sea level rise explicitly, but does include a purpose, which states in part, “to maintain or increase the shoreline devoted to water-dependent or water-related uses.”144 To effectuate this purpose the County set a goal to “limit public expenditures in areas subject to destruction by natural disasters; and protect human life and property in the coastal area of Miami-Dade.”145 The element prescribes accomplishing this goal by increasing the amount of shoreline devoted to water-dependent uses146 and directing future populations away from coastal high hazard areas.147

3. Hillsborough County

Hillsborough County takes a similar approach to that of both Miami-Dade and Monroe, in that they all recognize the need to prioritize shoreline development.148 While Miami-Dade and Monroe explicitly prescribe prioritizing water-dependent development on the shoreline to address shoreline scarcity and hazard potential, Hillsborough takes a more general route. Its coastal management element recommends that the county develop a mechanism to resolve conflicts between future development proposals in coastal areas.149 To this end, the element suggests incorporating certain factors within the developed mechanism, including limiting public expenditures for services and maintenance in coastal areas and minimizing inappropriate land uses by, among other things, prioritizing water-dependent uses.150

Hillsborough County’s coastal management element is most notable for its “Intergovernmental Coordination” section.151 This section recognizes that the regulatory jurisdiction over Tampa Bay is “fragmented amongst a multitude of federal, state and regional regulatory agencies, as well as seventeen local governments.”152 To aid its citizens in navigating this fragmented regulatory framework, the county included a comprehensive list of the agencies and local governments with oversight and describes their individual duties within that framework.153 This section would be extraordinarily helpful to anyone contemplating development in the Tampa Bay estuarine system or the adjacent coastal waters given its detailed list of all of the entities, from federal to local, with monitoring, permitting, and regulatory authority over the area.154

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145 Id. at VII-2.
146 Id. at VII-9.
147 Id. at VII-14.
148 Hillsborough County Comprehensive Plan, Coastal Management Element, 8 (2008).
149 Id.
150 Id. at 8-10.
151 Id. at 25.
152 Id.
153 Id.
154 Id. at 25-29.
4. Sarasota County

Sarasota County’s comprehensive plan directly addresses sea level rise and provides a range of appropriate adaptation strategies. The plan states,

[c]hanging sea level will also have effects on coastal construction. Scientists estimate that 70 percent of the world’s sandy beaches are affected by coastal erosion induced by relative sea-level rise. How our community responds to these changes may very well determine whether we will have beaches or hardened shorelines in their stead.\textsuperscript{155}

To deal with these challenges, the County adopted setback lines by ordinance which restrict development waterward of those lines in order to protect those chosen areas from “improper development that could lead to degradation of coastal systems . . . and adversely affect the public’s health, safety, and welfare.”\textsuperscript{156} Additionally, the Comprehensive Plan makes prospective recommendations for combating the potentially harmful effects of sea level rise.”\textsuperscript{157}

“There are several ways to protect these resources in the face of current erosion patterns: 1) landward relocation of structures which allows the beach to migrate and erode naturally; 2) structural or passive restoration of the beaches and dunes; 3) a combination of the first two methods; or 4) purchase of lands by government for recreation, resource protection and to prevent costly government-financed reconstruction following storm events. Whichever form it takes, protection of the County's beaches will be expensive.”\textsuperscript{158}

Sarasota County’s comprehensive plan is exemplary in its explicit recognition of sea level rise and the dangers it poses to both the county’s citizens and the environment.\textsuperscript{159}

IV. Facility management approaches

A. Florida’s Working Waterfronts

Working waterfronts are water-dependent infrastructure by statutory definition.\textsuperscript{160} The Florida Legislature has recognized that maintaining both recreational and commercial working waterfronts is an important state interest.\textsuperscript{161} The importance of the state interest is further demonstrated by the requirement for local governments to include a shoreline use component in

\textsuperscript{155} Sarasota County Comprehensive Plan, Chapter 2-Environment, 30 (2014). Internal citation omitted.
\textsuperscript{156} Id. at 32.
\textsuperscript{157} Id. at 38.
\textsuperscript{158} Id.
\textsuperscript{159} Id. at 29.
\textsuperscript{160} Fla. Stat. § 342.07 (2015) (“Recreational and commercial working waterfronts require direct access to or a location on, over, or adjacent to a navigable body of water. The term includes water-dependent facilities that are open to the public and offer public access by vessels to the waters of the state or that are support facilities for recreational, commercial, research, or governmental vessels. These facilities include public lodging establishments, docks, wharfs, lifts, wet and dry marinas, boat ramps, boat hauling and repair facilities, commercial fishing facilities, boat construction facilities, and other support structures over the water.”).
\textsuperscript{161} Fla. Stat. § 342.07 (2015).
their comprehensive plans which addresses the need for preserving recreational and commercial working waterfronts.¹⁶²

B. Structure of Florida’s Inland Navigation Districts

Inland navigation districts are special districts which may be created by special act pursuant to the Florida Constitution and which may be vested with taxing authority to enable them to carry out their purpose of protecting the public’s use rights in certain state channels.¹⁶³ Two inland navigation districts exist within Florida: the Florida Inland Navigation District (FIND) and the West Coast Inland Navigation District (WCIND).¹⁶⁴

The Florida Legislature created the FIND and the WCIND to meet the requirements of the federal Rivers and Harbors Act of 1960, which calls for the construction, maintenance, and operation of inland waterways in Florida.¹⁶⁵ The FIND and WCIND are designated as the United States Army Corps of Engineers’ local sponsors tasked with acquiring land for, creating, and maintaining the Atlantic Intracoastal Waterway and the Gulf Intracoastal Waterway, respectively.¹⁶⁶ In addition to maintaining of these inland waterways, Legislature has tasked these districts with maintaining “any other public navigation channels authorized by the Board of Trustees of the Internal Improvement Trust Fund.”¹⁶⁷

The FIND covers 12 counties along Florida’s east coast and is governed by the Board of Commissioners of Florida Inland Navigation District.¹⁶⁸ This Board comprises 12 members, one from each county upon which the FIND is overlaid.¹⁶⁹ Each member is appointed by the Governor and must be confirmed by the Senate.¹⁷⁰ Board members are appointed for a four year term or until their successors are duly appointed.¹⁷¹ The WCIND is similarly governed, but is much smaller as it spans only four counties.¹⁷²

The Florida Legislature charged the Boards of both inland navigation districts with a requirement to develop a long-range plan for maintenance of their respective intracoastal waterways.¹⁷³ In

¹⁶⁵ Fla. Stat. § 375.975 (2015); See also 33 U.S.C. § 577(c) (2014) (“local interests shall provide without cost to the United States all necessary lands, easements and rights-of-ways for all projects to be constructed under authority of this section.”).
¹⁶⁶ FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 1 (2015).
¹⁶⁷ FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 2 (2015) (Nassau, Duval, St. Johns, Flagler, Volusia, Brevard, Indian River, St. Lucie, Martin, Palm Beach, Broward, and Miami-Dade.).
¹⁶⁸ FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 2 (2015). (Manatee, Sarasota, Charlotte, and Lee)
¹⁶⁹ FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 2 (2015).
¹⁷⁰ WEST COAST INLAND NAVIGATION DISTRICT, STRATEGIC PLAN 2008-2013, 2 (2014) (Manatee, Sarasota, Charlotte, and Lee)
¹⁷¹ FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 2 (2015).
¹⁷² FLORIDA INLAND NAVIGATION DISTRICT, STATEMENT OF AGENCY ORGANIZATION AND OPERATION 2 (2015).
considering the design of the FIND’s long-range plan, the Legislature recommended that the FIND maintain a channel depth of about 12ft “depending upon specific local conditions” with reference to the plane of local mean water. 174 This recommendation can reasonably construed to require the FIND to consider sea level rise in designing its long-range plan, given that changes in sea level will necessarily affect the depth of the intracoastal channel.

C. Florida’s Ports

Florida has 15 ports: Jacksonville, Port Canaveral, Port Citrus, Fort Pierce, Palm Beach, Port Everglades, Miami, Port Manatee, St. Petersburg, Tampa, Port St. Joe, Panama City, Pensacola, Key West, Fernandina.

1. Structure

Each of Florida’s ports was created through “local and/or state legislative processes” and has developed in accordance with the needs of its locality, resulting in differing operating structures and relationships to governmental entities at all levels of State government. 175 To demonstrate, compare the governing body of the Jacksonville Port Authority with that of the Tampa Port Authority. The board of the Jacksonville Port Authority consists of four members appointed by the governor of Florida and three appointed by the Mayor of Jacksonville. 176 The Tampa Port Authority similarly consists of 7 members; however, five of those members are appointed by the governor, one is a member of the Hillsborough Board of County Commissioners, appointed by those commissioners, and the seventh is the Mayor of Tampa. 177

Florida law recognizes these fifteen ports as public entities vital to the State’s economy. 178 Accordingly, the Florida Legislature has created three separate entities to fulfill different purposes with respect to overseeing projects undertaken by ports within the State. First, the Florida Seaport Transportation and Economic Development Council (“Seaport Council”) exists to oversee distribution of state funds for eligible seaport capital improvement projects. 179 Second, established by interlocal agreement, the Florida Ports Financing Commission exists to facilitate port project financing. 180 While the Seaport Council’s mission is to approve or disapprove of port projects and distribute state funds accordingly, the Commission’s mission is to garner private

175 Florida Department of Transportation, Florida Seaport System Plan ES-2 (2010).
176 Rexford B. Sherman, American Association of Port Authorities [AAPA], Seaport Governance in the United States in Canada 5 (2002).
177 Tampa Port Authority Enabling Act, Ch 95-488 (2007).
179 Fla. Stat. § 320.20 (2015); Fla. Stat. § 311.09(1) (2015) (“The Florida Seaport Transportation and Economic Development Council is created within the Department of Transportation. . . The council consists of the following 17 members: the port director, or the port director’s designee, of each of the ports of Jacksonville, Port Canaveral, Port Citrus, Fort Pierce, Palm Beach, Port Everglades, Miami, Port Manatee, St. Petersburg, Tampa, Port St. Joe, Panama City, Pensacola, Key West, and Fernandina; the secretary of the Department of Transportation or his or her designee; and the director of the Department of Economic Opportunity or his or her designee.”).
funding for Seaport Council approved port projects through revenue bond issuance.\textsuperscript{181} Third, the Florida Ports Council is a nonprofit corporation governed by a Board of Directors comprised of the directors of the fifteen Florida ports and tasked with providing administrative support services to the Seaport Council.\textsuperscript{182} Once the Seaport Council has approved a port project application, the Department of Economic Opportunity must assess whether the project is consistent with the Florida Seaport Mission Plan and with the state economic development goals and policies.\textsuperscript{183}

The Florida Legislature charged the Seaport Council with preparing a “5-year Florida Seaport Mission plan defining the goals and objectives of the council concerning the development of port facilities.”\textsuperscript{184} The Seaport Council is required to prepare a plan consistent with the FDOT’s Transportation Plan.\textsuperscript{185} The 2060 Florida Transportation Plan (“FTP”) recognizes broad goals such as “effective planning, efficient decision making, [and] wise investments.”\textsuperscript{186} These broad goals call for proactive planning that could account for sea level rise.

Additionally, the FTP recognizes that maintaining Florida’s desirable status as a global trade hub will require ports to deepen their channels and expand terminals to accommodate future growth.\textsuperscript{187} Despite these goals and objectives in the FTP, the Seaport Council, in issuing its most recent Seaport Mission Plan in 2013, did not explicitly recognize the need to account for sea level rise or climate change in planning future development of port facilities.\textsuperscript{188}

In addition to State level agencies with port oversight listed above, the Legislature has also directed the local governments, through development of their coastal management elements, to oversee that ports are developed and maintained in an orderly manner so as to facilitate commercial navigation.\textsuperscript{189}

2. Management Approaches

The Florida Legislature has charged ports with the responsibility of developing plans to ensure waterways are susceptible to safe deepwater shipping commerce.\textsuperscript{190} These plans are termed master plans by statute, but are also often referred to as strategic plans.\textsuperscript{191} Florida law requires port master plans to meet the criteria for and be integrated with the appropriate local

\textsuperscript{181} Id.; See also Fla. Stat. § 320.20 (2015) (“To better enable the ports to cooperate to their mutual advantage, the governing body of each port may exercise powers provided to municipalities or counties in s. 163.01(7)(d) subject to the provisions of chapter 311 and special acts, if any, pertaining to a port. The use of funds provided pursuant to this subsection is limited to eligible projects listed in this subsection).


\textsuperscript{185} Id.

\textsuperscript{186} FLORIDA DEPARTMENT OF TRANSPORTATION, 2060 FLORIDA TRANSPORTATION PLAN 3 (2010).

\textsuperscript{187} Id. at 7.

\textsuperscript{188} FLORIDA SEAPORT TRANSPORTATION AND ECONOMIC DEVELOPMENT COUNCIL, FLORIDA SEAPORT MISSION PLAN 2013-2017 (2012).


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government’s coastal management element. Further, Florida Legislature found that maintenance of authorized water depths is a “necessary activity that is in the public interest” and directed FDEP to process port dredging permit applications in an “expeditious” manner to further this public interest.

In preparing this guidance document, the authors analyzed the master plans of thirteen of Florida’s fifteen ports. All of these ports’ master plans include general objectives such as increasing profits, decreasing expenses, and increasing efficiency. However, only the Port of Miami’s master plan accounts for the impact of sea level rise on its infrastructure construction and maintenance costs.

One of the biggest concerns involving the future of the Port of Miami is global climate change and the threat of sea level rise. Sea level rise, one of the likely effects of global warming, is a major threat to all coastal communities and infrastructure. . . . The Port must also consider future project modifications that may reduce or eliminate the adverse impacts from sea level rise and evaluate the structural integrity of structures near the ocean that are subject to potential hazards cause by sea level rise.

In order to avoid damage from sea level rise, the Port of Miami’s master plan recommends raising Dodge Island from its current elevation of 7.5ft NGVD to a minimum of 10ft NGVD, which is FEMA base flood elevation. One possible explanation for why the Port of Miami was the only port to include sea level rise in its master plan is the fact that the port participates in the Miami-Dade County Climate Change Advisory Task Force, which recommended that all county agencies, including the port, assess the impact of climate change on their responsibilities.

While not mentioning sea level rise explicitly, the 2014 update to the Port of Everglades master plan considered Broward County’s “efforts with respect to climate change.” Additionally, during a 2015 port expansion and harbor deepening feasibility study, the USACE, performing the study for the port, explicitly considered sea level rise and concluded that,

“The structural aspects of the project will be either unaffected or can be easily adapted to accommodate the change. . . . The primary impact of R[elative] SLR on this project may

194 Port Citrus and Port of Pensacola were not included in this review.
195 See e.g., PORT OF JACKSONVILLE, STRATEGIC MASTER PLAN 2014 5 (2014) (identifying as two of its main goals to develop “operationally and financially compatible” long and short-term plans and “deliver annual profitable business growth”).
196 See PORT OF MIAMI, MASTER PLAN 2035 (2012).
197 PORT OF MIAMI, MASTER PLAN 2035 21 (2012).
198 Id.
199 FLORIDA CLIMATE INSTITUTE, SURVEY-ADAPTATION OF PORTS TO THE IMPACTS OF CLIMATE CHANGE 2 (2013).
be its potential impact on mitigation measures proposed for mangroves and seagrasses at West Lake Park under the high SLR scenario.  

The Southeast Florida Regional Climate Change Compact (Climate Compact) initiative is aiding ports in incorporating sea level rise into their planning process. As discussed in the case study below, the Southeast Regional Climate Change Compact Analysis of the Vulnerability of Southeast Florida to Sea Level Rise assessed the potential impacts of sea level rise on ports within its jurisdiction.

Any Florida port operation requiring the approval of the USACE must account for sea level rise after the USACE issued ER 1165-2-212. For example, in preparing to make improvements to the Jacksonville port, the USACE considered sea level rise in accordance with Engineering Circular 1165-2-212, a precursor to Engineering Regulation 1100-2-8162.

Failing to take sea level rise into account is likely to result in future increased costs to the port. Any infrastructure construction or maintenance done without considering sea level rise may need to be repeated in the future, thereby imposing greater costs on the port. Aside from the direct potential adverse effects of sea level rise on port infrastructure, production capacity constraints of the construction industry provides ports with additional motivation to incorporate sea level rise into their planning process. Current port coastal defensive structures utilize concrete and steel and studies indicate “that global capacity for producing these materials is insufficient for constructing protective structures around each of the world’s top economic ports in less than 50-60 years.”

Given the developments in international trade, particularly the expansion of the Panama, ports will need to timely make infrastructure alterations to ensure they remain competitive in the international shipping market. Again, the Port of Miami is exemplary in this area as it plans to deepen its South Channel to 50 to 52ft to accommodate the new post-Panamax ships.

V. Case Studies

A portion of the research conducted in preparation for this report comprised semi-structured interviews with planners, port officials, water-dependent businesses, and other interested professionals to gauge the extent to which sea level rise has been taken into account over

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202 Analysis of the Vulnerability of Southeast Florida to Sea Level Rise, SRCCC Inundation Mapping and Vulnerability Assessment Workgroup (Aug 2012)
207 PORT OF MIAMI, MASTER PLAN 2035 3 (2012).
selected planning horizons. These interviews led to identification of communities which are on the vanguard of proactively planning for sea level rise. This section of this report discusses three entities whose plans to address sea level rise are noteworthy: the city of Miami Beach, the city of Fort Lauderdale and the Climate Compact.

A. City of Miami Beach

Recognizing it is vulnerability to sea level rise, the City of Miami Beach has taken steps to mitigate its adverse effects. In 2007, the City Commission created a Green Ad-Hoc Committee to provide the community a forum to discuss environmental issues.\(^\text{208}\) The City Commission transformed the ad hoc committee into the permanent Sustainability Committee in 2009 with the mission to “identify and promote policies and practices within the city to help achieve a sustainable environment.”\(^\text{209}\) In conjunction with establishing the Sustainability Committee, the City Commission codified Chapter 100: Sustainability in the City Code.\(^\text{210}\) While not addressing sea level rise directly, the chapter, by essentially incorporating green building and energy efficiency guidelines into the City Code, seeks to combat practices that arguably contributed significantly to rising water levels.\(^\text{211}\)

In 2010, the Sustainability Committee created a Sustainability Plan, adopted by the City Commission, to “improve resources, prevent harm to the natural environment, protect human health, and benefit the social, economic, and environmental well-being of the community for present and future generation.”\(^\text{212}\) Despite the plan identifying “Building Code adaptivity to sea-level change” as an initiative, the City’s Code makes no mention of sea level rise, nor does it even appear to account for the risks of its adverse effects.\(^\text{213}\)

Although not incorporating sea level rise into its building code, the City of Miami Beach has explicitly accounted for “sea level change” in its Stormwater Management Master Plan (“SWMMP”).\(^\text{214}\) In its 20-year capital improvement program, the SWMMP accounts for sea level change over a 20-year planning horizon for stormwater infrastructure and 50-year horizon for seawall heights.\(^\text{215}\)

In addition to sea level rise generally, another prominent factor in the City’s decision to develop the new SWMMP is the problem facing the city as a result of exceptionally high tides.\(^\text{216}\) Sometimes called “king tides,” these very high tides begin in July or August, peak in October,

\(^{208}\) City of Miami Beach, FL., Sustainability Plan 4 (2010).


\(^{210}\) City of Miami Beach, FL., Sustainability Plan 4 (2010).

\(^{211}\) Miami Beach, Florida, Ch. 100 (2015).

\(^{212}\) City of Miami Beach, FL., Sustainability Plan 2 (2010).

\(^{213}\) See City of Miami Beach, FL., Sustainability Plan 21 (2010).

\(^{214}\) City Miami Beach, FL., Stormwater Management Master Plan ES 1-2 (2015) (Note: The Stormwater Management Master Plan had not been adopted as of the drafting of this article. However, the City of Miami Beach provided an Executive Summary which contained the information cited. It is available at http://miamibeachfl.gov/publicworks/scroll.aspx?id=27280 (last visited May 5, 2015)).

\(^{215}\) Id.

\(^{216}\) Interview with Bruce Mowry, City Engineer, City of Miami Beach, Fl. (April 1, 2015).
and end in December.\textsuperscript{217} King tides are characterized by higher than normal tides for one week during each of those months.\textsuperscript{218} According to Bruce Mowry, the City Engineer for the City of Miami Beach, the higher tides experienced by the city during the King tide period caused the city’s gravity flow stormwater drainage infrastructure to become ineffective.\textsuperscript{219} Not surprisingly, when coupled with rain, the city’s streets flooded.\textsuperscript{220}

The City of Miami Beach addressed this problem in the short-term by installing check valves, which only allow outflow, at points where stormwater pipes discharge into the Biscayne Bay, and pumps to give the stormwater sufficient pressure to overcome the increased inflow pressure associated with the high tides.\textsuperscript{221} Recognizing that these installments were only a patch and not a full solution, Miami Beach raised the stormwater infrastructure design sea level considerations by two feet in the new SWMMP.\textsuperscript{222} The city chose the two-foot increase because it accounted for the King tide phenomenon and added another foot for future sea level rise.\textsuperscript{223}

In addition to stormwater drainage infrastructure issues, the city identified seawalls, beaches, and the low street and building elevations as other pressing issues facing the city as a result of impending sea level rise.\textsuperscript{224} To address impact to the 60 miles of seawall in the city, Miami Beach is considering incorporating new seawall design specifications into the City’s Code in the near future, so that the financial impact of improving the seawalls could be borne over time, rather than when the infrastructure becomes inadequate due to rising water.\textsuperscript{225} Specifically, Miami Beach is considering raising the seawall height standard by 2ft., from 3.2ft to 5.2ft.\textsuperscript{226}

Miami Beach is also implementing requirements on buildings to prepare for rising water. Because sea level rise will eventually require the city to raise its streets and sidewalks, and because all structures within the city are within a floodplain, the city is currently requiring new buildings to include false fronts.\textsuperscript{227} This allows the building’s ground floor to be above street level, yet still accessible to persons with disabilities, and already capable to accommodating a higher street level.\textsuperscript{228}

With a city built upon a foundation of coarse limestone, sea level rise not only threatens to flood the city through the storm drains, but to inundate Miami Beach from the bottom.\textsuperscript{229} The coarse limestone is porous, so the increase in the water table caused by sea level rise will cause the water to seep through the city’s foundation and present the city with another significant issue that

\textsuperscript{217} Id.  
\textsuperscript{218} Id.  
\textsuperscript{219} Id.  
\textsuperscript{220} Id.  
\textsuperscript{221} Id.  
\textsuperscript{222} Id.  
\textsuperscript{223} Id.  
\textsuperscript{224} Id.  
\textsuperscript{225} Id.  
\textsuperscript{226} Id.  
\textsuperscript{227} Id.  
\textsuperscript{228} Id.  
\textsuperscript{229} Id.
must be addressed through another creative engineering solution. However, Miami Beach’s proactive planning is preparing the city for sea level change. Bruce Mowry stated that sea level rise, “whether natural or anthropogenically induced, is occurring so we need to talk about adaptive solutions because [for Miami Beach] retreat from the sea is not an acceptable alternative.”

B. Fort Lauderdale

In 2009, the city of Fort Lauderdale joined in the SRCCC. In 2010, the City Commission passed an ordinance creating the Sustainability Advisory Board (“SAB”) with the mission to “establish the City of Fort Lauderdale as a leader in environmental sustainability.” The SAB consists of 11 members serving one-year terms without compensation. Additionally, in 2011 Fort Lauderdale issued a Sustainability Action Plan. This plan’s goal is to better prepare the community “through good stewardship and improved efficiency, to improve quality of life, foster eco prosperity and climate resiliency.”

While the Sustainability Action Plan includes many goals related to decreasing the city’s impact on the environment, a few of its prescriptions are specifically worth noting. One, the plan recommends applying a “systematic approach” to the city’s adaptation strategies that includes “identification of areas vulnerable to sea level rise looking at multi-disciplinary sectors followed by developing targeted adaptation strategies.” Two, the plan recommends “enhanc[ing] communication about climate change adaptation in coordination with other agencies and municipalities.” Three, the plan prescribes encouragement of infill development to discourage “development in low lying, vulnerable areas regarding climate change.” Finally, the plan, under the objective to “preserve and expand coastal habitats,” recommends development of a program to “encourage, promote incentivize, and coordinate initiatives that relate to the natural beach environment.”

In April 2013, the Fort Lauderdale City Commission unanimously voted to approve the city’s vision plan, entitled Fast Forward Fort Lauderdale: Our City, Our Vision 2035. The plan “is a fusion of the collective values and aspirations that have been expressed by a diverse cross-

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231 Interview with Bruce Mowry, City Engineer, City of Miami Beach, Fl. (April 1, 2015).
235 Id. at 2.
236 Id. at 24.
237 Id. at 21.
238 Id.
239 Id. at 56.
240 Id. at 59.
section” of the city’s residents, garnered from an extensive outreach effort that collected 1,562 ideas from people throughout the community. While many cities perform neighborhood surveys to assess citizen satisfaction, the city of Fort Lauderdale is the only one to incorporate sustainability questions into its citizen surveys.

Developed to provide “an inspirational view of what the city wants to become,” the Vision 2035 plan includes six vision statements. Four of the six vision statements explicitly mention sea level rise as a factor in the planning process. The most notable of the six visions is entitled “we are ready: we are a resilient and safe coastal community.” This vision came as a product of Fort Lauderdale’s citizens expressing concerns regarding risks associated with sea level rise:

The 2012 Fort Lauderdale Neighbor Survey found that 41% of respondents were dissatisfied with the City’s prevention of tidal-related flooding, which reflected a shift from traditional concerns that had been focused more on water quality. In addition, at least 71% agreed that they had observed coastal water-level increases or increased flooding. These results, coupled with other climate change concerns, served as notice that something needed to be done. With Fort Lauderdale’s unique topography of canals and beachfront, without addressing global warming, it will be underwater by 2035.

After hearing concerns like these and reviewing the available data, “the city concluded, without reservation, that the time was right to factor the projected climate change impacts into all of [its] functions, and most importantly, implement programs and projects to respond to those anticipated impacts” (emphasis in original). As assistant city manager Susanne Torriente noted, “everything [the city] is doing with respect to sea level rise planning is about being proactive.” According to the 2035 vision plan, some of the envisioned responses to these challenges include developing self-nourishing beaches, made possible by “an innovative technique that captures the southward natural coastal movement of sand” conveying “every grain back to their beaches.”

In addition, the city also envisions replacing its current aging infrastructure with a more resilient and permeable system engineered to withstand the effects of climate change. In making its resiliency preparations, the City relies on a unified sea level rise projection prepared as part of the SRCCC.

In September 2013, following the adoption of its 2035 Vision Plan and relying on that statement’s framework, the City Commission adopted a 5-year strategic plan to implement the aspirations identified in the 2035 plan. The strategic plan, entitled “Press Play Fort Lauderdale,”

243 Interview with Susanne Torriente, Assistant City Manager, City of Fort Lauderdale, Fl. (April 10, 2015).
244 CITY OF FORT LAUDERDALE, FL., VISION PLAN 2035 at 2, 8 (2013).
245 Id. at 18, 22, 47, 55.
246 Id. at 2, 8.
247 Id. at 25-26.
248 Id. at 22.
249 Interview with Susanne Torriente, Assistant City Manager, City of Fort Lauderdale, Fl. (April 10, 2015).
251 Id. at 26.
252 Id. at 2.2
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incorporates 42% of the vision ideas of the 2035 plan. The strategic plan recognizes the need to make infrastructure and budgeting decisions with sea level rise in mind. As the executive summary of the strategic plan states:

We are surrounded by water, and this poses challenges and opportunities now and in 2035. In the 2012 Neighbor Survey, 70% of residents observed coastal water level increases and 68% observed increases in flooding. Infrastructure was the top-voted category for discussion at the Neighbor Summit. The more resilient we make our beaches, drainage systems, bridges, roads, and homes, the less damage inclement weather and high tides will inflict on our City. We will reduce our risk and avoid debilitating costs from disaster response and infrastructure rebuilding. As we make wise, calculated decisions about our infrastructure, we will be able to effectively manage increased water supply demands by reducing our per capita use and reuse. In addition, improved drainage of water and wastewater will ensure a cleaner water supply for our neighbors and visitors. Our investments in foundational infrastructure will continue to pay dividends by enhancing quality of life now and for future generations.

The strategic plan includes two goals related to infrastructure planning that explicitly incorporate sea level rise into the planning process. Before delineating the specific objectives of each goal, the strategic plan includes this policy statement:

Strategic community investments that consider adaptation and resiliency are important now and for future generations. Like many coastal communities, Fort Lauderdale is consciously incorporating ways to address climate change, sea level rise, and impacts from extreme weather events into our short and long-term operations and planning. In the next five years, the City will focus on continuing our progress by proactively lining pipes, inspecting and cleaning water lines, and creating Adaptation Action Areas and traditional gray and natural green infrastructure, such as water retention parks and bioswales. Roads, sidewalks, and bridges need smart investments and maintenance in ways that meet resiliency and daily transportation needs. While prior generations made significant investments to ensure that we have sound infrastructure, we are now responsible for maintaining and preparing for future challenges and demands.

While one infrastructure goal, focusing on making the city multi-modal and more pedestrian friendly, indirectly addresses sea level rise, the second infrastructure goal directly addresses sea level rise and is intended to increase the sustainability and resiliency of the community. The preamble to the second goal states:

254 Id. at 8.
255 Id.
256 Id. at 14.
257 Id. at 22.
258 Id. at 27.
Given our coastal location, beginning in the next five years and continuing beyond, the City will focus on building a sustainable and resilient infrastructure. We are surrounded by water and impacted by high tides, heavy rain events, and sea level rise, all of which significantly impact our drainage and gravity sewer infrastructure. We will need to design differently to account for these changes. This means smart investments in our community infrastructure for short-term and long-term economic and environmental viability and quality of life. Our roads, bridges, water and wastewater systems, and drainage infrastructure will need to be maintained and updated in accordance with sea level rise projections and other coastal threats.\(^\text{259}\)

Specifically, the second infrastructure goal identifies two objectives explicitly demanding incorporation of sea level rise into infrastructure planning.\(^\text{260}\) The first calls for an “examination of funding options to maintain and update [the city’s] aging bridge infrastructure considering sea level rise;”\(^\text{261}\) and, the second objective calls for incorporation of sea level rise and resiliency projections into the Stormwater Management Plan and the Floor Hazard Mitigation program.”\(^\text{262}\)

Our interview with Assistant City Manager Susanne Torriente indicated that the elevation difference between the City of Fort Lauderdale and the City of Miami Beach made a significant difference in the impacts of sea level rise on their stormwater infrastructure.\(^\text{263}\) While the City of Miami Beach needed to install pumps to ensure effective drainage, the city of Fort Lauderdale chose only to install tidal valves and found those alone to be “very successful.” However, the elevation difference doesn’t mean the city of Fort Lauderdale is not contemplating potentially installing pumps in the future, it only means they have more time to do more sea level rise modeling and more time plan resource allocations according those more precise models.\(^\text{264}\)

\section*{C. Regional: The Southeast Florida Regional Climate Change Compact}

The Southeast Florida Regional Climate Change Compact (Climate Compact) is a regional partnership among four counties—Broward, Monroe, Miami-Dade and Palm Beach—to address their vulnerability to climate change.\(^\text{265}\) The White House chief science advisor, John Holdren, has described the Climate Compact as “a model for what we need to see going on around the country.”\(^\text{266}\) The Climate Compact organization began with adoption of the Climate Compact

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\(^{259}\) Id.

\(^{260}\) Id. at 29.

\(^{261}\) Id.

\(^{262}\) Id.

\(^{263}\) Interview with Susanne Torriente, Assistant City Manager, City of Fort Lauderdale, Fl. (April 10, 2015).

\(^{264}\) Id.


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1. The challenge

Through its foundational document, the Climate Compact, the Climate Compact member counties agreed to the following shared principles, among others:

Florida is considered one of the most vulnerable areas in the country to the consequences of climate change … especially sea level rise….268

[T]he four counties of Southeast Florida and their respective populations, totaling more than five million residents, are expected to share in disproportionately high risks associated with climate change due to low land elevations[ and] rising sea level projections...269

and

[T]he region as a whole, must give significant consideration to adaptation strategies designed to protect public infrastructure.270

These principles define the unique threat that sea level rise poses to southeast Florida and specifically identify public infrastructure as an asset which must be protected from sea level rise. While the Climate Compact anticipates reducing greenhouse gas emissions as a necessary response to climate change, it also notes that “[s]ea level will continue to rise even if mitigation efforts to reduce greenhouse gas emissions are successful at stabilizing or reducing atmospheric CO2 concentrations.”271 Further, “[a] substantial increase in sea level rise within this century is likely and may occur in rapid pulses rather than gradually.”272 Therefore, the Climate Compact considers specific strategies for adapting to sea level rise, rather than just mitigating the causes of climate change.

2. Strategies for action

As one of its first tasks, the Climate Compact developed a five year regional Climate Change action plan to adapt to regional and local impacts of climate change.273 The plan, titled A Region Responds to Climate Change, identifies specific goals and action-items responsive to climate

267 SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT COUNTIES, SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT (2009).

268 Id. at 1.

269 Id.

270 Id.


272 Id.

change. The Climate Compact has formed work groups to tackle particular issues. The first three work groups were focused on the built environment, transportation, and land and natural systems, where “workshop participants brainstormed issues including the scope of the Regional Climate Action Plan, criteria to select priority issues, defining regional versus local efforts, areas of expertise needed in issue specific work groups and how best to separate issue areas to be examined into logical, workable groupings.”\textsuperscript{274} More specific work groups followed, such as the Inundation Mapping and Vulnerability Assessment Work Group, which creates vulnerability maps and other assessments to better define the challenges sea level rise poses.\textsuperscript{275}

Although the Climate Compact establishes shared goals, it also stresses that “because of the variances in government structures, management policies, land use authorities, charters (where present), and the political environments of member counties and municipalities, implementation is expected to take on different forms…and implementation must be flexible to address specific local conditions.”\textsuperscript{276} Therefore, despite the high degree of cooperation between the member counties, the Climate Compact anticipates that its common goals may be addressed differently in the region’s communities. Discussed in greater detail here are the Climate Compacts goals—and progress toward those goals—in the areas of vulnerability mapping, infrastructure investment, public policy, and collaboration and outreach.

\textit{a. Vulnerability mapping}

The Climate Compact’s strategies include prioritization of “regional mapping of projected sea-level rise” and adaptation preparation “for the regional economy, regional infrastructure and the built environment.”\textsuperscript{277} The Climate Compact has produced two work products that pursue that goal. The first, \textit{A unified Sea Level Rise Projection for Southeast Florida}, provides one shared data set of appropriate projections for sea level rise in the region. In preparing the document, the Climate Compact noted, “the Climate Compact Counties recognized the critical need to unify the existing local SLR projections to create a single regional SLR projection.”\textsuperscript{278} In surveys of owners and managers of water dependent infrastructure, a common response to the question of what resources respondents needed to address sea level rise was better data and analysis.\textsuperscript{279} Southeast Florida now has a single source for the best available sea level rise projections.

The second work product, \textit{Analysis of the Vulnerability of Southeast Florida to Sea Level Rise}, goes beyond sea level rise projection to examine specific public assets which sea level rise

\begin{footnotesize}
\begin{itemize}
\item[\textsuperscript{274}] \textit{Id.} at 10.
\item[\textsuperscript{275}] \textit{Id.} at 8.
\item[\textsuperscript{276}] \textit{Id.} at 13.
\item[\textsuperscript{277}] \textit{Id.} at 2.
\item[\textsuperscript{279}] See, e.g., Interview with Jackie Gorman, Director of Planning & Community Development, City of Crystal River (2015); Interview with Leif Lustig, Dockmaster, City of Fort Myers Yacht Basin (2015); Interview with Ron Thorstad, Manager, Titusville Municipal Marina (2015); and Interview with Betty Webb, Administrator, City of Apalachicola (2015).
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Planning for Sea-Level Rise

threatens.\textsuperscript{280} The report does this on a county-by-county basis and provides detailed inundation information for different locations.\textsuperscript{281} Regarding water dependent infrastructure, the report notes “[d]etermining vulnerability to marinas proved difficult and was only reported by Miami-Dade.”\textsuperscript{282} Therefore, “[i]mpacts to coastal marina facilities remain a concern but are not yet sufficiently documented.”\textsuperscript{283} Also, “[p]ort properties, despite their coastal location, are generally not shown to be vulnerable to sea level rise until the three foot scenario.”\textsuperscript{284} When ports are vulnerable to sea level rise, the report also found that support infrastructure, such as that for stormwater management, is typically vulnerable before the port itself.\textsuperscript{285}

\textit{b. Sound infrastructure investment}

The Climate Compact began its consideration of infrastructure with a survey of vulnerable infrastructure. For example, one of the Climate Compacts action items is to “[i]dentify transportation infrastructure at risk from climate change in the region; determine whether, when, where, and to whom projected impacts from climate change might be significant.”\textsuperscript{286} Further, the Climate Compact authored document \textit{Analysis of the Vulnerability of Southeast Florida to Sea Level Rise} identifies specific infrastructure which is vulnerable to see level rise and makes efforts to quantify the site by site vulnerability.\textsuperscript{287}

The Climate Compact further reiterates, in separate policies, the familiar sea level rise adaptation strategies of protection, retreat and accommodation. For example, the Climate Compact addresses retreat by advising that new development be placed on the most appropriate land, possibly away from vulnerable coastal areas.

The recommended projection provides guidance for the Compact Counties and their partners to initiate planning to address the potential impacts of SLR on the region. …To ensure public safety and economic viability in the long run, strategic policy decisions will be needed to develop guidelines to direct future public and private investments to areas less vulnerable to future sea level rise impacts.\textsuperscript{288}

\textsuperscript{281} See, Id.
\textsuperscript{282} Id. at 6.
\textsuperscript{283} Id. at 49.
\textsuperscript{284} Id. at 6.
\textsuperscript{285} Id.
Also, the Climate Compact addresses accommodation with its aim to “provide a more resilient natural and built physical environment in light of climate change,” as a form of risk reduction.289 Finally, the Climate Compact addresses protection with its goal to “[c]ontinue to implement and enforce strong building codes that require new construction and substantial improvements to existing structures to mitigate against the impacts of flooding, severe winds, and sea level rise…”290

c. Public policy

The Climate Compact has successfully driven policy changes applicable to the entire state of Florida. For example, at the state level, the Climate Compact was a driving force behind the Florida Legislature providing for adaptation action areas in Florida’s growth management statutes.291 Due to this progress, it has received recognition for its development of adaptation action areas and received greater recognition for adaptation as a critical sea level rise response strategy.292

The Climate Compact’s goals to influence broader public policy, however, go beyond its focus on Florida’s growth management laws. Regarding water supply, management, and infrastructure, the goal of the Compact is to “advance water management strategies and infrastructure improvements needed to mitigate for adverse impacts of climate change and sea level rise on water supplies, water and wastewater infrastructure, and water management systems.”293 Such activities are not only affecting planning in the Climate Compact member counties but are changing policies that affect other communities which are vulnerable to sea level rise throughout Florida.

d. Collaboration and outreach

The Compact recognizes “a continued commitment to collaborate with local, state and federal policy makers, as well as the non-profit and private sectors, is fundamental to long-term success of the Compact.”294 In pursuit of this commitment, the Climate Compact has established outreach and public engagement goals such as its intent to “communicate the risks related to climate change and the value of adapting policies and practices to achieve resilience throughout the region.”295 As a specific example, the Climate Compact participated in direct advocacy by composing a letter to President Obama after the 2010 Deepwater Horizon Oil Spill that threatened the environment and economy of the ecoregion.

290 Id.
291 Id. at 4.
292 Id.
293 Id. at 27.
294 Id. at 4.
295 Id. at 42.
3. Future steps

Going forward, the Climate Compact recognizes its substantial work has not eliminated uncertainty in how southeast Florida will continue to respond to sea level rise. Rather, “there are more than 100 local governments in the region, each at varying stages of climate mitigation and adaptation planning and implementation.”\textsuperscript{296} And the plans of each of these communities are not likely to remain static: “[a]s scientists develop a better understanding of the factors and reinforcing feedback mechanisms impacting sea level rise, [southeast Florida communities] will need to adjust and adapt to the changing projections.”\textsuperscript{297}

The work of the Climate Compact, however, has developed substantial data, even as it identifies the limitations of that data. One resource future work will require is additional funding.\textsuperscript{298} The Climate Compact has urged Congress to create a source of permanent funding for infrastructure investments.\textsuperscript{299} And the Climate Compact intends to continue to encourage policies to improve resilience to coastal and inland flooding, salt water intrusion, and other related impacts of sea level rise in local government planning efforts.\textsuperscript{300}

\textsuperscript{296} Id. at 50.
\textsuperscript{299} Id. at 42.
\textsuperscript{300} Id. at 2.
Appendix—Interview responses

Name: Stephen H. Bogner
Phone: (305) 329-4755
Email: sbogner@miamigov.com
Organization: City of Miami, Florida
Position: Marina’s Manager

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

   Two wet slip marinas; dry storage marina; mooring facility.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   Generally, upgrade infrastructure in accordance with our capital plan and as/when needed.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   Primarily to meet the needs of our markets (wet, dry, moorings); plan for life expectancy issues (utilities, pumpout, piling, docks, finger piers, mooring units, etc.).

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Regulatory agency operating and construction permits (ex. USACOE, FDEP, DERM) from federal to state to county to local building/zoning permits that dictate what we can and cannot construct on/over the water.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   Yes.

6. What challenges do you expect to face due to sea level rise?

   The usual: fixed piers & finger piers, under-dock utilities, aids to navigation, mooring unit down lines & pennant lines, sea wall height vs. MLW.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   I am moving to Montana.
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8. Could you describe the process through which you developed these plans?

   We are municipal facilities; subject to the planning whims (or lack of) by our
elected officials.

9. What obstacles do you foresee in implementing your plans?

   Money, lack of vision at the elected leadership level.

10. What, if any, assistance or tools do you need to plan for sea level rise?

    Read a lot, talk to regulatory agencies and industry peers, develop some type of
action plan for the intermediate future. Perhaps I'll speak to Governor Scott
about this issue.

11. Does your planning process, in particular, meaning your capital improvements or financial
planning process, affect your view of planning for sea level rise?

    Absolutely - access to funding dictates what actions we will or will not take.

12. Have you identified any “best practices” regarding managing and adapting water-dependent
infrastructure for sea level rise?

    No - I believe that any new construction contemplated must factor this in - any
retrofitting of existing facilities will be difficult & very expensive. Perhaps
regulatory agency permitting will not allow the retrofitting of working waterfront
infrastructure.
1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

*Within City of Fernandina Beach limits, there is the following water-dependent infrastructure. While not all owned by the City, the City is to some degree a stakeholder in discussions surrounding this infrastructure.*

- Port of Fernandina (not operated by the City - operated by Ocean Highway and Port Authority)
- Working waterfront along Amelia River (Waterfronts Florida designated) - portion of which is City-owned
- Amelia River navigation channel (dredged/maintained by US Army Corps for Kings Bay Naval Base)
- Boat Ramps (one City/one County along Amelia River)
- Beach access points (City-owned).

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

*Locations may change or be added, but in general the infrastructure is expected to remain. An example is the City-owned public parcels along the Amelia River working waterfront which are slated for development as a riverfront park. Another example is a planned kayak launch at one of our City parks.*

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

*For City-owned infrastructure, the primary tool is capital improvement planning. Other non-CIP funded projects are funded as separate projects by the City Commission.*

*CIP planning takes place during the annual budget cycle which starts in April. All department heads are invited to weigh in on the CIP and evaluate it against Comprehensive Plan policies and other plans.*

*Grant funding is another popular funding source that the City looks to use. Sometimes projects are on the CIP, sometimes not.*
4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

Any applicable state or federal permits would be required. Local permits may be needed depending on the nature of the infrastructure improvements. The most common would be building permits.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

Yes.

6. What challenges do you expect to face due to sea level rise?

- Impacts to public infrastructure and private property.
- Elected official support for decisions related to sea level rise/flooding threats.
- Engaging the community around the issue.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

We have included a policy in our Conservation and Coastal Management element of our Comprehensive Plan recognizing sea level rise and the need to work with partners to start planning for it.

We are also working on a separate resiliency plan which will address coastal/shoreline hazards as well as general disaster/resiliency planning. As part of this, the SJRWMD is assisting us with a shoreline evaluation study to help identify and plan for shoreline protection strategies. Nassau County is currently updating its LMS plan and we are participating in the process to try to identify projects within the City that could be included in the LMS as relates to hazard mitigation, of which sea level rise/flooding may be one of the issues.

We are acknowledging sea level rise in other plans, such as our municipal cemetery master plan, and in our parks and recreation master plan. In the latter, we are especially looking at ways to incorporate stormwater concerns into the parks/public space system. The issue of protecting cultural resources from sea level rise is another question for our historic community.

Another strategy is to raise community awareness and provide outreach on this issue. We have had a resiliency lecture series, with one session on sea level rise.

8. Could you describe the process through which you developed these plans?

Varies, depending on the plan. Generally, it's a public process with staff driving the coordination of the planning effort, involving stakeholders and the public, and ultimately moving it up to the City Commission.
9. What obstacles do you foresee in implementing your plans?

   Community and elected official support. From the elected officials, funding will be the biggest hurdle, particularly if there is not community support for a particular project.

10. What, if any, assistance or tools do you need to plan for sea level rise?

   Community outreach strategies, elected official buy-in, tangible steps to take for projects that may be more doable in small bites than one massive project.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

   Somewhat...projects are often on our CIP for a very long time, and the funding year just gets moved out further and further. This may help depending on the planning horizon for sea level rise, but it's also a concern that projects may not get done in time.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

   Aside from identifying the issue in plans, and doing some informal vulnerability assessments (meaning nothing on paper at this point), no.
Planning for Sea-Level Rise

Name: Sam Chavers
(telephone interview, responses transcribed by author)
Phone: (941) 955-9488
Email dockmaster@marinajacks
Organization: Marina Jack, Sarasota
Position: Dockmaster and Director of Marina Operations

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   Marina with 350 slips. And Mooring field for 55 boats.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   Grow and change in respond to public demand. Economic stability and market demand are drivers. The City of Sarasota is the lessee and Marina Jacks is currently at maximum capacity under its lease so it is not considering expanding.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   No response.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Permitting process begins with the Department of Environmental Protection. Then it goes through Army Cops of Engineers and the Fish and Wildlife Service. The local government also plans a role in planning and building functions, including permitting things like construction of and electrical on docks.

   These permitting processes do not address sea level rise in any way.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   Somewhat familiar with projections.

   Industry does not take into account planning for sea level rise. It is not a factor. Has not been a factor in the past in planning for future construction.

6. What challenges do you expect to face due to sea level rise?

   Docks are floating docks. So the docks should be able to respond to sea level rise without problem. The upland is at the greatest risk. The shore is defended by a seawall and is currently elevated about four feet above mean high tide.
7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

    *Future response might include engineering. The speed of the rising, in relation to current position, is not rapid enough to have addressed possible responses.*

8. Could you describe the process through which you developed these plans?

    *No response.*

9. What obstacles do you foresee in implementing your plans?

    *No response.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

    *No response.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    *No response.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    *Assume there are best practices. What we lack is facts on what is rising and how fast. When will it affect us? One inch tomorrow will not pose threat. When will the rise be up to a foot? That would have an impact.*

    *Dissemination of information is adequate. State of Florida and other publications are adequately communicating.*
Planning for Sea-Level Rise

Name: Scott Gebhard
Phone: (954) 921-3035
Email: sgebhard@hollywoodfl.org
Organization: City of Hollywood
Position: Dockmaster

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

Marina.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

The boats are becoming larger and more upscale requiring more and more electricity and amenities.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

We are unfortunately located in a residential neighborhood that is not receptive to any expansion, it is politically not viable.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements)?

Permits? All of the above. And sea grass limits potential projects as Broward County is out of mitigation areas.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

From news stories only.

6. What challenges do you expect to face due to sea level rise?

We are at sea level now and experience flooding from tides and rain events, I personally believe the entire area will be submerged in the not too distant future. (50 years??).

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

The City is addressing storm water pump station and drainage valves, however I believe this to be a short lived solution (20 - 50 years??) Marinas would need to be built with extra long pilings and floating docks to overcome sea level rise. We have fixed docks.
8. Could you describe the process through which you developed these plans?

   *This planning and implementation is done by the Department of Public Utilities, I'm in Parks & Rec.*

9. What obstacles do you foresee in implementing your plans?

   *Money.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

   *No response.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

   *No response.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

   *No response.*
Planning for Sea-Level Rise

Name: Jackie Gorman
Phone: (352) 795-4216
Email: JGorman@crystalriverfl.org
Organization: City of Crystal River
Position: Director of Planning & Community Development

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

   We own all the man-made upland canals within the City limits of Crystal River.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   We expect our water dependent infrastructure to remain the same with the exception of the construction of new mooring fields.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   The process includes understanding ownerships (city or state), preparing conceptual drawings, approval from Waterfront Advisory, Planning Commission and City Council, budgeting, design and construction.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements)?

   We require permits from FDEP, ACOE (Fish & Wildlife if near sanctuary) and City of Crystal River Building Department.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   Yes.

6. What challenges do you expect to face due to sea level rise?

   Future planning efforts and comprehensive plan updates should be included in the data and analysis that discusses these affects and establishes sensible goals and objectives for the future 25 years.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   Information included in the City's EAR amendments.
8. Could you describe the process through which you developed these plans?

   *Process established by the State.*

9. What obstacles do you foresee in implementing your plans?

   *Since this will affect the future and not "now" I foresee this not being taken too seriously by most people unless we educate.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

    *Data and analysis.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    *Yes.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    *Not at this time.*
Planning for Sea-Level Rise

Name: Richard Grosso  
(telephone interview, responses transcribed by author)  
Phone: (954) 262-6140  
Email grossor@nsu.law.nova.edu  
Organization: Nova Southeastern University Law Center  
Position: Law Professor / Legal Expert

Note: Richard Grosso is an attorney and law professor, not a manager or owner of water dependent infrastructure. Responses are not provided to interview questions which are not relevant to Mr. Grosso’s expertise.

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   No response.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   No response.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   No response.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   No response.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   No response.

6. What challenges do you expect to face due to sea level rise?

   No response.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   No response.

8. Could you describe the process through which you developed these plans?
No response.

9. What obstacles do you foresee in implementing your plans?

No response.

10. What, if any, assistance or tools do you need to plan for sea level rise?

No response.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

The two biggest things for local government [in relation to control of water-dependent infrastructure] are things in the comprehensive plan to govern where you're allowed to expand or build anew and where you're allowed to put either newly or expanded infrastructure, and [the second is] self-imposed limits through the comprehensive plan or even the local government charter about where they can spend their money, where they will spend tax dollar money to subsidize or support vulnerable locations, coastal high hazard areas, etc.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

The city of Fort Lauderdale is doing the pilot project on adaptation action areas and has been proactive in having a sustainability department and an assistant city manager, Susan Torriente, running a very proactive position. Also, the City of Miami Beach is taxing existing residents to fund significant upgrades to stormwater infrastructure.
1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

*MARINA.*

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

*Expansion and replacing of pilings.*

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

*Economy and need driven for all capital improvements.*

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

*Army Core of Engineers, DEP, and State permitting required.*

5. Are you aware of sea level rise and projections of its affect on coastal lands?

*No we are not planning for future sea level concerns at this time.*

6. What challenges do you expect to face due to sea level rise?

*Our current facility will not change from a rising sea level unless it is dramatic.*

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

*None.*

8. Could you describe the process through which you developed these plans?

*None.*

9. What obstacles do you foresee in implementing your plans?

*None.*
10. What, if any, assistance or tools do you need to plan for sea level rise?

Funding.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

Yes greater expense in needing longer pilings.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

No.
1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

   All of the above.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   Port Panama City is built out at the present location. We are exploring a joint public/private partnership to expand facilities. Activities at the present location will be directed toward maintaining aging berth aprons and bulkheads. Inland support facilities will be upgraded or modified to react to and anticipate market needs.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   Capital improvements, whether market or age related are ranked by immediacy of need. Available state grant funds are researched and matched to available matching funds from revenue.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Most water related projects are regulated by the Florida Dept of Environmental Protection and the USCOE. Inland infrastructure is permitted through the consolidated city/county building dept.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   no.

6. What challenges do you expect to face due to sea level rise?

   unknown.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   none at present.
8. Could you describe the process through which you developed these plans?

   Not applicable.

9. What obstacles do you foresee in implementing your plans?

   Not applicable.

10. What, if any, assistance or tools do you need to plan for sea level rise?

    information on probability of it occurring.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    No response.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    No response.
Planning for Sea-Level Rise

Name: Leif Lustig  
Phone: (239) 321-7080  
Email: llustig@cityftmyers.com  
Organization: City of Fort Myers Yacht Basin  
Position: Dockmaster

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   I manage the City of Fort Myers Yacht Basin which is a public use, wet-slip, fixed dock marina including of 284 permitted slips including moorings. The marina also oversees a dual lane public boat ramp.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   I expect to see continued increase in demand for services as more people retire to the area.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   The maintenance of the current structures is the primary focus with $5.6 million dollars spent on those repairs and improvements over the last 13 years. Future Capital improvements are proposed to include popular floating dock structures, additional fixed docks for increased demand from vessels over 50' in length, a possible multi-floor vehicle parking garage and a new marina office/store building.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Federal, State and City permits are required for all construction to include construction type, location, use, and utilities.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   I have heard to "buzz" and understand that the earth has always fluctuated environmentally and that human actions may create additional influences on those environmental fluctuations, but I do not agree with the rumored severity and timeframe for these storied sea level rises.

6. What challenges do you expect to face due to sea level rise?

   The marina would suffer great loss of access and usage if the associated Caloosahatchee River increased in height by three feet and would become
unusable if more than four feet of water level rise was experienced.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

As the entire southwest area of Florida would also be unusable if those sea level rises were experienced, the City of Fort Myers Yacht Basin would have to elevate its entire structure as would all of coastal Florida which is totally impractical. The new coastline would simply be further inland for continued similar uses as the present coastal areas which would cease to be utilized.

8. Could you describe the process through which you developed these plans?

Common sense.

9. What obstacles do you foresee in implementing your plans?

Appropriate funding and the severity and speed of any sea level rise.

10. What, if any, assistance or tools do you need to plan for sea level rise?

Broader examination of timeframes and water elevations need to be reviewed for much larger areas and not simply individual businesses which may be affected. There is no point in modifying the City of Fort Myers Yacht Basin if the City of Fort Myers is no longer accessible and usable.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

Sea level fluctuations would be considered in the engineering of any Capital projects.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

None at present, other than the increased use of floating docks.
Planning for Sea-Level Rise

Name: Bruce Mowry  
Phone: (305) 673-7080  
Email: BruceMowry@MiamiBeachFL.gov  
Organization: City of Miami Beach  
Position: City Engineer

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

*Sea Walls, Navigation Channels, Bridges, Marinas, Beach, Recreation/Parks.*

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

*Sea walls will be increase in elevation, channels will be cleared, bridges elevated, sand replacement on our beaches, elevation of our grades throughout the City.*

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

*Funding and rate setting.*

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements)?

*Federal, State and Local.*

5. Are you aware of sea level rise and projections of its affect on coastal lands?

*The City of Miami Beach is a leader in implementing infrastructure improvement to address sea level rise. We are reviewing and changing our land planning rules and building codes.*

6. What challenges do you expect to face due to sea level rise?

*Elevating existing structures and finding suitable soil to bring to grade.*

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

*The City is spending around 500 million dollars in the next 5 years to address sea level rise and this does not include the private sector investment.*

8. Could you describe the process through which you developed these plans?

*Technical Panels and public meetings along with an elected body that support the plan to address sea level rise.*
9. What obstacles do you foresee in implementing your plans?

   \textit{Funding.}

10. What, if any, assistance or tools do you need to plan for sea level rise?

   \textit{Templates of upgraded building code changes necessary to require the proper upgrades to construction of new and remodeling of buildings.}

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

   \textit{Significantly increased the size of our capital budget.}

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

   \textit{Raising elevations of all critical components (electrical and mechanical) and raising finish floors by adding free board requirement above base flood elevations.}
Planning for Sea-Level Rise

Name: Bruce Mowry
(telephone interview, responses transcribed by author)
Phone: (305) 673-7080
Email BruceMowry@miamibeachfl.gov
Organization: City of Miami Beach
Position: City Engineer

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   A large number of docks, marinas, seawalls, sand dunes, and a forcemain used to import freshwater and export wastewater.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   We don’t operate a commercial port, so our primary basis for our economy is tourism; a lot of high-end condos and hotel/motels, and a key asset is the beach itself.

   A key asset for our economy is maintaining the beach. We are always looking at replenishing sand and dunes— we are currently enhancing our dunes both to create vegetation for ecological purposes and also for protection from storm surge. We take out invasive plants, rope it off, encourage native plants, and do seeding. We make sure to leave openings in the dunes to ensure the public has easy access to the beach.

   The backside of the city has the pleasure boats and housing that are built on the shoreline all areas that could be impacted. All of these areas are bound by seawalls, mostly private, but the city does own about 3 miles of seawalls—57 miles are private—looking to them now for height and longevity to not deteriorate as quickly.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   N/A

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   N/A

5. Are you aware of sea level rise and projections of its affect on coastal lands?
Our residents have been able to recognize it. We are aware that our city is only a few feet above sea level. Stormwater drainage was basically gravity oriented—the city coined the term “sunny day flooding”—when there are certain lunar and solar conditions that create higher tides called King Tides. During this period, the city saw water just freely flowing into the city. During this time, people could be driving in 6 to 8 inches of water. This water comes out of the stormwater drainage outfall and into the city, which makes the residents were very aware that SLR and its potentially huge impact. This awareness helped sell and educate the public on the issue.

6. What challenges do you expect to face due to sea level rise?

   King Tides sometimes called Autumn Tides. This phenomenon may occur as early as July occurs about a week per month from October through December. During those weeks, water floods the streets twice a day as the tides rise.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   First, installed one-way check valves on the stormwater drains to keep water out. The valves allow rainwater go out, and prevent the tide from flowing in. The key issue arose when it rained during high tides. During this period, the outflow valves are closed to prevent the tide from coming in, but this also prevent the rainfall from draining out. Realizing we needed the ability to pump, we installed pumps throughout the city to pump the rainwater out during high tides to remedy the problem.

   As for the seawalls, we are putting regulations in place now to ensure seawalls are built or improved with sea level rise in mind. Putting the rule in place now will minimize the financial impact of adaptation on the community. Given they have a natural lifespan, seawalls will need to be rebuilt anyway, so we thought it best to ensure they were built with SLR in mind.

   Currently city ordinance requires sea walls to be at 3.2 ft elevation, but the City is looking 30, 50, 100 years into the future to predict better, higher standards in order to build these heights now.

   Will be raising the city and be evaluating techniques to manage the groundwater. Particularly, we are currently designing and constructing buildings with higher floor elevations where the fronts have façades that allow you to enter the store through ramps or stairs inside the building. As the sidewalk is raised, which will have to be done, the building be at street level. This method allows us to adapt buildings into the issue of addressing SLR over the plan life of a building.
8. Could you describe the process through which you developed these plans?

*Originally, the Mayor and Commissioners ran on platform to prevent flooding. The 2012 master plan used “mean sea level” threshold, so the Commission recommended raising drainage design criteria assumptions by 2 feet so that we have some level of adjustment accounting for future SLR. Two feet is about a king tide with a little over a foot more.*

9. What obstacles do you foresee in implementing your plans?

*The city is built on a porous limestone foundation, which is prone to flooding when groundwater levels rise.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

*N/A*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

*We proposed adding 300 million to enhance funding from stormwater drainage. Our consulting firm estimated 460 million would be needed.*

*The city’s residents consider themselves the sea level rise “test crowd.” These people understand it because it happens to them. The difference between Miami Beach and other cities is that we actually have an implementation plan.*

*We don’t believe our investment is considered waste of money. It has to happen. Like a patient on a life support system; if you aren’t willing to put them on life support- then you’re going to lose the patient. We have to keep the city viable and the city operating, and if we have to spend the money to keep the city viable, we have to be willing to spend the money.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

*We got the idea for the false storefronts from other cities. NYC, Galveston, Atlanta, and Chicago have all used this idea.*

*Climate change is already in process; you’re not going to stop it. It’s still going to be 30 to 50 years until we see a benefit from our emissions reduction efforts. Man made or nature, it’s there, it’s going to happen. Let’s talk about adaptive solutions. Retreat [from the sea] is not an acceptable alternative.*

*We are here to share and if other share ideas, we are glad to have them.*
1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

- Port
- Harbor
- Waterfront
- Navigational channel
- Barge Canal.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

Rapidly changing to growth markets in cruise and cargo industries. Larger ship require wider navigable channels and deeper waterways and berths.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

Decisions are based on investments and returns. Decisions are planned for future growth based on industry projections and contracts with current firms who do business with the Port.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

Permits are local, State, Federal, Corps of Engineers, DEP FDEP, EPA, FWC. Not all agencies work together but their permits are required for almost all projects.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

The Port has been briefed on rising sea levels.

6. What challenges do you expect to face due to sea level rise?

This could affect access to cargo ships, cruise ships, dock height, wharf construction, flooding.
7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   *No current plans. Monitoring situation.*

8. Could you describe the process through which you developed these plans?

   *Engineering firms hired by the Port advise the Port of developing situations that will require adjustments in current construction practices and standards.*

9. What obstacles do you foresee in implementing your plans?

   *Raising wharfs affects all operations. ADA compliance for access to cruise ships is a major concern. Adjusting water run off for filtering before it enters the harbor.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

    *We have Engineering firms who consult for the Port to keep the Port advised.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    *Sea level rise affect capital planning when a greater cost impact is required to upgrade docks and piers. No monies are actually budgeted for sea level rise.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    *For cruise, we have adjustable gangways which automatically adjust to tide conditions.*
Name: Joe Springer  
Phone: (904) 310-3300  
Email: jspringer@fbfl.org  
Organization: Fernandina Harbor Marina  
Position: Marina Manager

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

*120 Slip marina with concrete floating docks and a 20 device mooring field.*

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

*We are investigating increasing the mooring field by as many as 79 additional mooring devices. Due to a constant 12-18 inch annual siltation rate, considerations and discussion are taking place to determine if the marina should relocate further north or further west.*

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

*If a plan is agreed on, the City staff will request a item to be added to the Commission agenda where the item would be discussed and the financing decided.*

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

*DEP, ACOE, Fish and Wildlife, National Fisheries.*

5. Are you aware of sea level rise and projections of its affect on coastal lands?

*Yes.*

6. What challenges do you expect to face due to sea level rise?

*Additional siltation.*

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

*Install a secondary seawall and backfill to encourage natural scouring to remove the sediment.*

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8. Could you describe the process through which you developed these plans?

   *All plans are still on the drawing table. Applied Technology and Management is assisting with the mooring field increase considerations.*

9. What obstacles do you foresee in implementing your plans?

   *Funding.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

   *Unknown.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

   *Yes, it can't be done if it can't be afforded.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

   *Yes.*
A Guide for Managers, Owners and Regulators of Water-dependent Infrastructure

Name: Ron Thorstad
Phone: (321) 863-6099
Email: ron.thorstad@titusville.com
Organization: Titusville Municipal Marina
Position: Manager

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   I manage a municipal marina with 205 slips on five docks and 30 moorings. We also have 4 buildings within 20 feet of the water. These building sit at only 3 - 4 feet above mean water level.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   I would like to replace our ship's store with a two story building that incorporates new an office, restrooms, showers and laundry.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   All improvements require an intense CIP (capital improvement process). Our marina budget must be analyzed to locate a source of funds to match grants and funding from the City's general funds.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   we have a submerged land lease from the state with "fee waived" status. This requires us to adhere to strict state and county DEP guidelines. Any changes to our facility that are over the water require a new DEP permit. Changes to our land based infrastructure, require the usual City permits.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   I only have a bare working knowledge of projections for rising sea levels and how that will affect us.

6. What challenges do you expect to face due to sea level rise?

   A three foot rise in the sea level will flood our entire marina as well as a substantial portion of Titusville along the lagoon. It is far above my pay grade to make decisions based on rising sea levels. I do try to stay informed and provide input to my department head.
7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   *I am not aware of any current plans to accommodate a rise in our sea level.*

8. Could you describe the process through which you developed these plans?

   *Not applicable.*

9. What obstacles do you foresee in implementing your plans?

   *City Hall moves very slowly.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

    *I would like a reliable source to keep me informed of all actual rises as well as projections.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    *Absolutely. Any new building at the marina must take into account rising sea levels.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    *Sadly, no.*
1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

_We have 52 bridges, 302 miles of canal coastline. Seven miles of beaches. Also, a new river than runs through downtown to middle of city._

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

_City is 104 years old. City is built out. It’s the downtown of Broward County. Development is redevelopment and it is happening in the downtown regional activity center. 4000 units currently under construction and we are looking to add 5000 more._

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

_Due to geographical limitations and funding restraints, there are no expansions or changes planned for the near future._

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

_Submerged land leases, however our infrastructure is considered public open-space access so there are no fees associated with the leases or either they are waived in most cases._

5. Are you aware of sea level rise and projections of its affect on coastal lands?

_Southeast Florida Regional Climate Compact reflects impacts to city from SLR. The local governments of the four counties that are part of the compact are all are using the SLR projections developed in 2012. The compact’s SLR projections predict 3-7 inches by 2030 and 9-24 inches by 2060._

_The Compact’s Working group is currently working on revisions based on IPCC numbers that came out this year._
6. What challenges do you expect to face due to sea level rise?

N/A

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

The city recently adopted its 2035 Vision Plan. Following that plan, the city adopted its first 5-year strategic plan, entitled Press Play Ft Lauderdale. The city is incorporating SLR projections in these strategic plans. Going through that vision process, residents were very open and vocal talking about Fort Lauderdale 2035 and climate issues. We have a pretty informed, supportive community and active neighborhood associations.

Last year, we developed a framework for 10-year stormwater management plan. Phase 1 includes the first 5 years and involves doing smaller scale neighborhood projects. The tidal valves have been very successful. We are currently doing modeling for Phases 2 and 3 to see where the needs are.

8. Could you describe the process through which you developed these plans?

The citizens were open and vocal. We have a pretty informed community and supportive commission. We also do resident satisfaction surveys. Most cities don’t. We have recently added some sustainability questions.

In my capacity as assistant city manager and my position with the Compact, and has the I have a unique opportunity to integrate sea level rise information more fully- training staff and incorporating that information into planning for any kind of infrastructure.

9. What obstacles do you foresee in implementing your plans?

N/A.

10. What, if any, assistance or tools do you need to plan for sea level rise?

N/A

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

N/A.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

In terms of infrastructure adaptation, it’s the Netherlands. The Dutch are masterful in this regard.
We are not going to leave south Florida. The question is what kind of incremental changes are we going to make to that infrastructure over time. Not to sound arrogant, but South Florida is a leader in this field. This takes a lot of innovation and creativity. It takes adaptation.
Planning for Sea-Level Rise

Name: Betty Webb
Phone: (850) 653-9319
Email bettywebb@cityofapalachicola.com
Organization: City of Apalachicola
Position: Administrator

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location.)?

   Two mooring basins, one located at Battery Park targeted at recreational vessels, the other one is Mill Pond targeted exclusively for seafood harvesting vessels, both have public boat ramps. There are several piers along the water front for public access to the Apalachicola Bay and River. The Intracoastal Waterway runs adjacent on the northeasterly side of the Apalachicola waterfront.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   We do not expect water dependent infrastructure to grow or change in the near future.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   Due to geographical limitations and funding restraints, there are no expansions or changes planned for the near future.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Submerged land leases, however our infrastructure is considered public open-space access so there are no fees associated with the leases or either they are waived in most cases.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   yes.

6. What challenges do you expect to face due to sea level rise?

   Unknown at this time. A complete analysis has not yet been considered or performed.
7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   Unknown at this time.

8. Could you describe the process through which you developed these plans?

   N/A.

9. What obstacles do you foresee in implementing your plans?

   N/A.

10. What, if any, assistance or tools do you need to plan for sea level rise?

    Guidance on how to analyze potential affects and planning for those affects identified.

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    N/A.

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    No.
Planning for Sea-Level Rise

Name: not provided
Phone: 
Email: 
Organization: 
Position: 

1. What type of water-dependent infrastructure do you own or manage (Generally, water dependent infrastructure includes ports, working waterfronts, navigation channels and other infrastructure which is dependent on a waterfront location)?

   Floating dock marina.

2. Generally, how do you expect your water dependent infrastructure will grow or change in the future?

   It is unlikely that there will be any growth of our marina in the foreseeable future. As far as change, we are considering dredging to increase the average depth throughout the marina. Likewise we are hopeful for an increase in our occupancy.

3. Please describe the crucial elements of your decision making processes when expanding or changing water-dependent infrastructure (i.e., what is your capital improvements or financial planning process for your water-dependent infrastructure?).

   Cost of dredging vs increase in revenue produced by higher occupancy of larger/deeper vessels.

4. How is your infrastructure regulated (e.g., What permits do you need? Are these permits based on federal, state, or local requirements?)?

   Federal, state and local dredging permits only.

5. Are you aware of sea level rise and projections of its affect on coastal lands?

   only anecdotally, but an increase in sea level means less dredging required.

6. What challenges do you expect to face due to sea level rise?

   none regarding the marina.

7. What, if any, plans do you have or adjustments will you make to accommodate for sea level rise?

   none.

8. Could you describe the process through which you developed these plans?

   Not applicable.
9. What obstacles do you foresee in implementing your plans?

    *Not applicable.*

10. What, if any, assistance or tools do you need to plan for sea level rise?

    *Not applicable.*

11. Does your planning process, in particular, meaning your capital improvements or financial planning process, affect your view of planning for sea level rise?

    *Not applicable.*

12. Have you identified any “best practices” regarding managing and adapting water-dependent infrastructure for sea level rise?

    *No.*