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Presidential Executive Orders Duel Over Floodplain Definition as S.E. Florida Prepares for Sea Level Rise

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PRESIDENTIAL EXECUTIVE ORDERS DUEL OVER FLOODPLAIN DEFINITION AS S.E. FLORIDA PREPARES FOR SEA LEVEL RISE

*Brion Blackwelder**

INTRODUCTION

At the time of this Article in late August 2017, the devastating Hurricane Harvey had just cleared Houston, Texas and the surrounding vicinity. Early reports raise many of the issues discussed here. This Article seeks opportunities for future preparedness. First, the clash over a Federal definitional rejection of flood risk dimensions is scrutinized. Second, locally-led preparedness against flooding from rising sea level, in the example of Southeast Florida, is offered as localities search for prevention and rebuilding measures.

On August 15, 2017, by Executive Order of President Donald Trump, the definition of floodplain for the Federal Flood Risk Management Standard (FFRMS) for federally funded projects nationwide reverted to its 1977 terms.¹ The Association of State Floodplain Managers (ASFPM) quickly called the change “a huge step backwards,” “extremely disappointing,” and an action that will “result in much higher costs” to U.S. taxpayers.² The definitional change comes at a time of great concern for the effects of current and future sea level rise (SLR) in the coastal and adjacent floodplains of the Southeast Florida region. Federally funded projects in the area serve the fundamental needs of vast populations, investments, and wetlands in what is rated by several measures as one of the most vulnerable

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1. Exec. Order No. 13,807, 82 Fed. Reg. 40,463 §6 (Aug. 15, 2017).

2. *ASFPM Reaction to Rollback of EO 13690 & FFRMS*, ASS’N OF STATE FLOODPLAIN MANAGERS (Aug. 15, 2017), <http://www.floods.org/n-news-hottopics/article.asp?id=516>.

locations to SLR in the world. The revised definition by the 2017 Executive Order diminishes the vertical and horizontal extent of the flood risk to be considered by the federally funded projects. Local government planning and actions for over 10 years have addressed resiliency measures regarding inundation due to SLR. This paper surveys the effects of the definitional change on the potentially extensive ramifications of SLR for local governments. It concludes with suggestions for future legal and policy strategies for the area facing the peril of flood.

Part One aspires to have rebuilding and future construction in floodplains across the nation return to the best criteria: a Climate-Informed Science Approach (CISA) definition of the floodplain of Executive Order 13690 of 2015. That definition is for the Federal Flood Risk Management Standard (FFRMS) that applied to federally funded projects. It was abandoned by Executive Order on August 15, 2017 in favor of an archaic 1977 definition using the 100-year flood for vertical and horizontal dimensions of the hazard.

Part Two focuses on sea level rise as it is being resiliently adapted to local government formation of the multi-county Southeast Florida Regional Climate Change Compact. Contrast is drawn to the federal floodplain dispute. The discussion sets out positive ramifications of dealing in this manner for communities in harm's way, starting with climate science as the basis. Local comprehensive planning, installation of large-scale pumps for high tides, and building of higher seawalls are core responses, but even so, the area's task is immense and the path forward uncertain.

The Article concludes by suggesting the inevitability that flood risk will someday return to a realistic standard. Such a standard should be a provision for Congress to include should it approve a plan for rebuilding of infrastructure so that we "get it right" in federally funded projects in the future. Restoration of the floodplain definition would be highly suitable for the dire hazards SLR poses to Southeast Florida. Therefore, the legislation should restore the revoked definition of floodplain for the Federal Flood Risk Management Standard to join ongoing local programs for resilience.

I. THE EXECUTIVE ORDERS

Executive Order 13807 of August 15, 2017 devotes most of its length to describing President Trump's trillion-dollar proposal to expedite the rebuilding of the nation's infrastructure by faster environmental reviews of federal infrastructure projects. In a single paragraph it revokes the Federal Flood Risk Management Standard (FFRMS) of President Barack Obama's Executive Order 13690.³ Obama's Executive Order 13690 itself amended the earlier Executive Order 11988 at Section 6(c) in the definition of floodplain.⁴ Revocation of Executive Order 13690, therefore, actually revives the 40-year-old floodplain definition found in Executive Order 11988 of 1977.

"Flooding is the most common and costly type of natural disaster in the United States, and floods are expected to be more frequent and more severe over the next century due in part to the projected effects of climate change." As the Obama administration's subsequent proposed rule to implement his Executive Order explained, its objective was to "ensure that FEMA Federally Funded Projects are designed to be resilient to both current and future flood risks."⁵ Executive Orders give formal instructions to agencies concerning policies or procedures, rather than being regulations adopted by notice-and-comment rulemaking under statutory delegation of authority.⁶ They confer no legal rights or benefits to the public, and are not enforceable in court.⁷

3. Exec. Order No. 13,690, 80 Fed. Reg. 6,425 § 2(i) (Jan. 30, 2015), *amending* Exec. Order No. 11,988, 42 Fed. Reg. 26,951 (May 24, 1977).

4. Exec. Order No. 11,988, 42 Fed. Reg. 26,951 § 6(c) (May 24, 1977).

5. Updates to Floodplain Management and Protection of Wetlands Regulations To Implement Executive Order 13690 and the Federal Flood Risk Management Standard, 81 Fed. Reg. 57,401 (proposed Aug. 22, 2016) (to be codified at 44 C.F.R. pt. 9).

6. See John Cooney, *Questions concerning Federal Regulations during the Obama-Trump Transition*, YALE J. ON REGULATION (Dec. 1, 2016), <http://yalejreg.com/nc/questions-concerning-federal-regulations-during-the-obama-trump-transition-by-john-cooney/> (discussing options for deregulation and cancelling policy directives of prior Presidents).

7. See *id.*; see also Exec. Order No. 13,807, *supra* note 1, at §7(c) (describing the disclaimers in the Executive Orders); Exec. Order No. 13,690, *supra* note 3, at §5(c).

A. *Obama's Executive Order redefines floodplain*

President Obama's Executive Order in 2015 revised by amendment the (then) 38-year-old Executive Order on the floodplain definition. Obama's purpose was responding to climate change and other flood threats "to create a new flood risk reduction standard for federally funded projects," after considering comments of Governors, mayors, and stakeholders.⁸ His Executive Order set up a flexible framework to "expand from the current base flood level to a higher vertical elevation and corresponding horizontal floodplain to address current and future flood risk and ensure that projects funded with taxpayer dollars last as long as intended."⁹ The FFRMS are established expressly in the Executive Order based on a coordinated interagency and stakeholders effort "to create a new flood risk reduction standard for federally funded projects" with recommendations for guidance to agencies originating from an interagency Mitigation Framework Leadership Group (Mit-FLG), chaired by the Administrator or designee of FEMA and the final Guidance issued by the Water Resources Council of FEMA.¹⁰ Rulemakings and procedures of other agencies were required to be consistent with the FFRMS.¹¹

FEMA had a comment period from August 22 until October 21, 2016 for its Notice of Proposed Rulemaking to implement the FFRMS established by Executive Order 13690.¹² The Notice stated "Flooding is the most common and costly type of natural disaster in the United States, and floods are expected to be more frequent and more severe over the next century due in part to the projected effects of climate change. This proposed rule would ensure that FEMA Federally Funded Projects are designed to be resilient to both current and future flood risks."¹³ The proposed rule requires each Federal agency take action to reduce the risk of flood loss projects FEMA funds including: federally undertaken, financed, or assisted construction and improvements, Federal activities and programs affecting land use, and managing

8. See Exec. Order. No. 13,690, *supra* note 3, at §1.

9. *Id.*

10. *Id.* at §3.

11. See Exec. Order. No. 13,690, *supra* note 3, at §2(e).

12. See Updates to Floodplain Management, *supra* note 5.

13. *Id.* at 57,403.

Federal lands and facilities.¹⁴ Included in the FFRMS “higher vertical elevation and corresponding horizontal floodplain” are: funded new construction and substantial improvements (directed toward States, Tribal governments, local governments), certain non-profit organizations, and Individual Assistance grants directed to individuals.¹⁵

Under Obama’s Executive Order, Federal agencies were to select how the floodplain is defined for risk management purposes from four alternatives. Executive Order 13690 states the former single definition of floodplain (“that area subject to a one percent or greater chance of flooding in any given year”) is stricken and in its place provided:

The floodplain shall be established using one of the following approaches:

(1) Unless an exception is made under paragraph (2), the floodplain shall be:

(i) the elevation and flood hazard area that result from using a climate-informed science approach that uses the best-available, actionable hydrologic and hydraulic data and methods that integrate current and future changes in flooding based on climate science. This approach will also include an emphasis on whether the action is a critical action as one of the factors to be considered when conducting the analysis;

(ii) the elevation and flood hazard area that result from using the freeboard value, reached by adding an additional 2 feet to the base flood elevation for non-critical actions and by adding an additional 3 feet to the base flood elevation for critical actions;

(iii) the area subject to flooding by the 0.2 percent annual chance flood; or

(iv) the elevation and flood hazard area that result from using any other method identified in an update to the FFRMS . . .

. . . Section 6 is further amended by adding the following new subsection (d) at the end: . . .

14. *See id.*

15. *Id.* at 57,422; *see also id.* at 57,427.

(d) The term ‘critical action’ shall mean any activity for which even a slight chance of flooding would be too great. . . .¹⁶

These four items are re-described by the Federal Emergency Management Agency (FEMA) as being: (1) a Climate-informed Science Approach (CISA), which is the generally favored approach according to FEMA, (2) a Freeboard Value Approach (FVA), (3) the 0.2-percent-annual-chance Flood Approach (0.2 PFA), or (4) the elevation and hazard area that results from using any other method identified in an update to the FFRMS.¹⁷ This definition would replace the single definition used in 1977 by Executive Order 11988.¹⁸ The 1977 definition, variously called the “100-year” or “base” flood, creates the floodplain based on a one percent or greater chance of flooding in any given year.¹⁹ The exceptions allowed under the 2015 amendment are, as expected, for national security, emergencies, or demonstrable inappropriateness, which enable an agency head to assume responsibility from the FFRMS and instead apply the 100-year base flood as the standard.²⁰

The four options for defining a flood plain provided in Obama’s 2015 Executive Order gave agencies some flexibility to select the most appropriate standard of the four options for their activities. The agencies determine first if a proposed action is in a floodplain, in an 8-step decision-making process that Guidelines from FEMA describe at length. The 8-step sequence poses questions such as whether the project is in a riverine or coastal floodplain, and alternatives to placing the project in the floodplain and the impacts.²¹ These definitional options drew the praise of the floodplain managers of ASFPM.²²

16. Exec. Order. No. 13,690, *supra* note 3, at §2(i).

17. See Updates to Floodplain Management, *supra* note 5, at 57,407-10.

18. See Exec. Order No. 11,988, *supra* note 4, at §6(c).

19. *Id.*

20. See Exec. Order. No. 13,690, *supra* note 3, at §2(i)(2).

21. FEMA, GUIDELINES FOR IMPLEMENTING EXECUTIVE ORDER 11988, FLOODPLAIN MANAGEMENT, AND EXECUTIVE ORDER 13690, ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT 41-80 (2015).

22. See *ASFPM Reaction to Rollback of EO 13690 & FFRMS*, ASS’N OF STATE FLOODPLAIN MANAGERS, *supra* note 2.

The function of Obama's Executive Order is important to elucidate. It announced the change in policy with the details of four approaches the agencies opt for, with details worked out at the start, based on an earlier interagency effort to "create a new flood risk reduction standard for federally funded projects."²³ It directed each agency affected by FFRMS to choose which specific standard to use in their respective rules, and the FEMA Guidelines document began the implementation, followed by FEMA's proposed rule.²⁴ The Guidelines explained:

Although the FFRMS describes various approaches for determining the higher vertical flood elevation and corresponding horizontal floodplain for federally funded projects, it is not meant to be an "elevation" standard. The FFRMS is a resilience standard. The vertical flood elevation and corresponding horizontal floodplain, determined using the approaches in the FFRMS, establish the level to which a structure or facility must be resilient. This may include using structural or nonstructural methods to reduce or prevent damage; elevating a structure; or, where appropriate, designing it to adapt to, withstand and rapidly recover from a flood event.²⁵

The 2015 floodplain definition was claimed to include a larger dimension of flooding in the risk management for federally funded projects. As stated by FEMA's Guidelines, "[T]he FFRMS seeks to improve upon the standards set forth in E.O. 11988 by providing a higher vertical flood elevation and expanded corresponding horizontal floodplain than the current base flood elevation and floodplain to address current and future flood risk for federally funded projects."²⁶

A distinction was to be made as to how to address federally funded projects, as opposed to other federal actions. "E.O. 13690 amended the term 'floodplain' as used in the 1977 version of E.O. 11988 to describe the available approaches from the FFRMS for determining the vertical flood elevation and corresponding horizontal floodplain for federally

23. Exec. Order. No. 13,690, *supra* note 3, at §2(i)

24. *See id.*

25. FEMA, *supra* note 21, at 4.

26. *Id.* at 36.

funded projects. One of these [four] approaches must be used for determining the FFRMS floodplain for these types of Federal actions. The 1-percent-annual-chance flood will be used, at a minimum, for determining the vertical flood elevation and corresponding horizontal floodplain for all other Federal actions.”²⁷

A wide range of federally funded projects were included under the 2015 Executive Order, according to the implementing Guidelines of FEMA. The Guidelines define “Federally funded projects” as “actions where Federal funds are used for new construction, substantial improvement, or to address substantial damage to structures and facilities.”²⁸ The term “action” is defined as “any of the following Federal activities: (1) acquiring, managing, and disposing of Federal lands and facilities; (2) providing federally undertaken, financed, or assisted construction and improvements; and (3) conducting Federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulating, and licensing activities.”²⁹ The term “facility” is defined as “any man-made or man-placed item other than a structure. (Examples include but are not limited to bridges and roads.)”³⁰ And “Structure” is defined as “a walled and roofed building, including a gas or liquid storage tank, that is principally aboveground, as well as a manufactured home” (as defined by the National Flood Insurance Program).³¹ This is an expansive list.

FEMA’s Proposed Rule in August 2016 further explained the large scope of projects affected by Executive Order 13690 and the FFRMS changes. “Executive Order 13690 and the FFRMS changed the Executive Branch-wide guidance for defining the ‘floodplain’ with respect to ‘federally funded projects.’ (*i.e.* actions involving the use of Federal funds for new construction, substantial improvement, or to address substantial damage to a structure or facility).”³² “In many cases, each of these approaches would result in a larger floodplain and a requirement to design projects such that they are resilient to a higher

27. *Id.*

28. *Id.* at 7.

29. *Id.* at 6.

30. *Id.* at 7.

31. *Id.* at 9.

32. Updates to Floodplain Management, *supra* note 5, at 57,403.

vertical elevation.”³³ Other actions that did not meet the definition of being federally funded would continue to use the “historical definition” of floodplain: one percent or greater chance of flooding in any given year, or for critical actions, 0.2 percent chance of flooding in any given year.³⁴ In addition, the proposed rule “would require the use, where possible, of natural systems, ecosystems processes, and nature-based approaches in the development of alternatives for all actions proposed in a floodplain.”³⁵

As a result of the FFRMS, certain federally funded projects under Executive Order 13690 were to use a flexible framework to increase resilience against flooding and preserve natural values of floodplains, expanding to a higher vertical elevation and horizontal dimension of the floodplain are described by ASFPM.³⁶ The subject matter of the current controversy affects projects such as rebuilding, at taxpayer expense, the infrastructure destroyed by flood and storm surge, which constitutes the most costly part of post-disaster assistance.³⁷ Other federal projects retrofit water or wastewater treatment plants, for example, at less cost than the tens of millions of dollars for repairs necessitated by flood damage.³⁸ Building structures and infrastructure higher or with more suitable materials and recognizing a wider floodplain as also in the hazard area are resiliency features. Such efforts would be helpful to a community’s resiliency strategies, as were those made using the science-based Unified Sea Level Projection of the Southeast Florida Regional Climate Change Compact discussed below. The function of the implementing Guidelines and the ways agencies were to comply are also significant, as the resulting process required several steps. “Agencies were directed to update their regulations and procedures, as appropriate, for implementing E.O. 11988 after these Guidelines were finalized. Each agency may have a different schedule for these updates based on the form of their agency-specific procedures. *Agencies will continue to comply with the requirements of the 1977 version of E.O. 11988 until they update their*

33. *Id.*

34. *Id.*

35. *Id.*

36. See Exec. Order. No. 13,690, *supra* note 3, at 2.

37. See *ASFPM Reaction to Rollback of EO 13690 & FFRMS*, ASS’N OF STATE FLOODPLAIN MANAGERS, *supra* note 2, at 1.

38. See *id.*

regulations and procedures to incorporate the amendments from E.O. 13690."³⁹ (Emphasis added).

Agencies began their processes to choose which of the alternative definitions to use. For instance, the U.S. Economic Development Administration (EDA) facilitates delivery of Federal economic development assistance to local governments for long-term community recovery planning, reconstruction, redevelopment and resiliency. EDA began to select an approach for its regulations and procedures to comply with Executive Order 13690, and solicited comments through March 22, 2016 on the floodplain definition it should select for its FFRMS. Its request for comments said "EDA is considering selection of the 0.2 percent annual-chance flood elevation (also known as the 500-year flood elevation) to define the floodplain for both critical and non-critical actions."⁴⁰

However, the agencies developing rules to implement the Obama approach did not get to the finish line of publication before the revocation of the 2015 Executive Order. These rules may be among the "... so-called 'ghost rules' [that] were withdrawn from the rulemaking process without any public notice or explanation."⁴¹ Such rules are those that may be at an advanced stage in the process but withdrawn before being finalized, according to Jessica Wentz and Tim Wang.⁴² In the example of the Small Business Association (SBA), Wentz and Wang report "[T]he Federal Emergency Management Agency (FEMA) has developed draft guidelines on implementing the FFRMS consistent with the directives of EO 13690; the final version of these guidelines would have applied to repairs and reconstruction funded through SBA loans had the proposed rule been adopted."⁴³ In addition, an SBA rule to require disaster loan recipients to adhere to

39. FEMA, *supra* note 21, at 5.

40. *Federal Flood Risk Management Standard Announcement*, U.S. ECONOMIC DEVELOPMENT ADMINISTRATION (Mar. 22, 2016), <https://www.eda.gov/programs/disaster-recovery/ffrms.htm>.

41. Jessica Wentz & Tim Wang, *Flood Management, Energy Efficiency Standards Among the "Ghost Rules" Quietly Withdrawn by Trump Administration*, CLIMATE L. BLOG, (Mar. 21, 2017), <http://blogs.law.columbia.edu/climatechange/2017/03/21/flood-management-energy-efficiency-standards-among-the-ghost-rules-quietly-withdrawn-by-trump-administration/>.

42. *See id.*

43. *Id.*

FFRMS provisions in disaster loans exceeding \$2 million for replacement or repairs also met the ghost rule fate.⁴⁴

B. President Trump's Executive Order Rolls Back the Federal Flood Risk Management Standard

On January 24, 2017 President Trump issued an infrastructure proposal by Executive Order.⁴⁵ That proposal also concerned the trillion-dollar concept for repair to infrastructure such as “crippled bridges, roads, and waterways” and “to spur development of transportation, water, and other core infrastructure.”⁴⁶ The proposal includes, as its title states, “Expediting Environmental Reviews and Approvals for High Priority Infrastructure Projects.”⁴⁷

Subsequently, on August 15, 2017 the Executive Order on “Establishing Discipline and Accountability in the Environmental Review and Permitting Process for Infrastructure” was announced.⁴⁸ At Section 6 it simply states: “Executive Order 13690 of January 30, 2015 (Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input), is revoked.”⁴⁹

C. President Trump's Executive Order revives the 1977 definition of floodplain

Revocation of the Obama Executive Order apparently (but not expressly) revives (the now 40-year-old) Executive Order 11988 of May 24, 1977. This is supported by the FEMA Guidelines remark: “Agencies will continue to comply with the requirements of the 1977 version of E.O. 11988 until they update their regulations and procedures to incorporate the amendments from E.O. 13690.”⁵⁰ As Section 6(b) of the 1977 Executive Order 11988 provides, the floodplain is to be at least the 1-in-100 year category flood: “The term

44. *See id.*

45. *See* Exec. Order No. 13,766, 82 Fed. Reg. 8,657 (Jan. 30, 2017).

46. FACT SHEET: PRESIDENT DONALD J. TRUMP WORKS TO REBUILD AMERICA'S INFRASTRUCTURE (2015).

47. Exec. Order No. 13,807, *supra* note 1, at 12.

48. *See id.*

49. *Id.*

50. FEMA note 21, at 5.

‘base flood’ shall mean that flood which has a one percent or greater chance of occurrence in any given year.”⁵¹ And in Section 6(c): “The term ‘floodplain’ shall mean the lowland and relatively flat areas adjoining inland and coastal waters including flood-prone areas of offshore islands, including at a minimum, that area subject to a one percent or greater chance of flooding in any given year.”⁵²

The 1977 Executive Order 11988 is revived because the Obama’s Executive Order 13690 only amended the floodplain determination of Section 6(c) and did not replace the entire Executive Order 11988. The federally funded projects standard from the 1977 Executive Order, stricken by the Obama Executive Order, now has returned without the improvements of the 2015 Obama Executive Order. These 2015 improvements are the required options (“The floodplain shall be established using one of the following approaches . . .”) based on climate science, 2 or 3 foot additional height, or the 500-year floodplain.⁵³ Coastal areas, with SLR compounded by storm surges and spring high tide events, are common sites for hugely expensive disaster aid and insurance costs. Those expenses are lessened by application of resiliency, but the repeal eliminates the centerpiece of the Obama strategy, the resilient alternatives incorporated how the floodplain is defined.

The Executive Orders are in the category of being “simply statements of the President’s policy priorities expressed as formal instructions to agency heads,” who have statutory authority to implement presidential directives.⁵⁴ This variety of policy directives and directions to agency heads to implement them “can be repealed immediately by a new President, by the simple act of issuing a new Order invalidating it.”⁵⁵ Alternatives to revoking the policy-preference type of Executive Order, via a new Executive Order, are summarized by John Cooney. Agency heads can be instructed to ignore an existing Executive Order (silent repeal), overturning policies of former Presidents, and thus avoiding “political heat.” However, by formally rescinding a previous Executive Order by another revocation-

51. Exec. Order No. 11,988, *supra* note 4, at 2.

52. *Id.*

53. See Exec. Order No. 13,690, *supra* note 3, at §2(i) (amending Exec. Order No. 11,988, at §6(c), *supra* note 4).

54. Cooney, *supra* note 6, at 1.

55. *Id.* at 2.

containing Executive Order, a President sends a larger message.⁵⁶ Obama articulated his intent about responding the effects of SLR in his revision of the old 1977 standard. Trump, using a press conference to emphasize the trillion-dollar proposal to rebuild the nation's infrastructure, made his message in the purpose statement of the Executive Order: "America needs increased infrastructure investment to strengthen our economy, enhance our competitiveness in world trade, create jobs and increase wages for our workers, and reduce the costs of goods and services for our families . . . More efficient and effective Federal infrastructure decisions can transform our economy, so the Federal Government, as a whole, must change the way it processes environmental reviews and authorization decisions."⁵⁷

At the time the Obama-era floodplain definition was ordered, the ASFPM commented that the reform made the United States more resilient to floods and storm surge and saved taxpayers "from having to pay, over and over again, to rebuild infrastructure" in federally funded projects.⁵⁸ It appears revocation of the definition will have the opposite effect on taxpayers.

II. SOUTHEAST FLORIDA PREPARES FOR SEA LEVEL RISE

Discussed here is the effect of the Federal policy change on how Southeastern Florida at the city and county level has come to address the projected inundation. The milestones discussed are: (A) early scientific SLR advisories to local officials in Miami-Dade County; (B) formation of a four-county Regional Compact and its plan to respond to overall climate change, including SLR; (C) innovative efforts in Florida in 2015, including the Unified SLR Projection agreed upon by the Compact to guide adaptive actions, completion of an adaptation Tool-kit for local governments, and legislation addressing the peril of flood and local comprehensive plans; and (D) identifying when tolerance yields to the need to retreat.

SLR adaptation activities of the Southeast Florida region will be achieved regardless of the differences in the Presidential Executive Orders. The adaptation would be improved by having high quality

56. *See id.*

57. Exec. Order No. 13,807, *supra* note 1, at §1.

58. *See ASFPM Reaction to Rollback of EO 13690 & FFRMS*, ASS'N OF STATE FLOODPLAIN MANAGERS, *supra* note 2.

FFRMS, as discussed below. The region's SLR conditions and options are described and, where applicable, related to the policy effect of the revival of the 1977 definition of floodplain for federally funded projects in place of the revoked reforms of 2015.

Over the past 10 years, officials of major Southeast Florida coastal cities have come to realize there will be very substantial land losses from SLR by the end of the century and they must find ways to be resilient against the impact. Risks are clear enough for localities to plan and implement their reactive measures – called adaptations – attuned to their geographic, economic, legal, and social settings.⁵⁹ A variety of adjustments are being implemented to meet the projected inundation of Southeast Florida. Protective defenses and practices will be tried to at least defer the disruptions or ultimate population relocations. Many features of policy and law arise from this SLR challenge to populations, structures, and resources.

SLR is “the biggest challenge the City of Miami will ever face,” its retiring mayor Tomas Regalado stated in a State of the City address.⁶⁰ The city is one of 24 signing cities to the Mayor's Climate Action Pledge, supportive of the Southeast Florida Regional Climate Action Plan.⁶¹ The “cost to upgrade the existing drainage systems and replace coastal infrastructure Citywide is estimated at over \$900 million.”⁶² For Miami, stormwater management is commonly the most beneficial local adaptation response, but it comes with great expense.

59. See James E. Parker-Flynn, *The Intersection of Mitigation and Adaptation in Climate Law and Policy*, 38 ENVTL. L. & POL'Y J. 1, 6 (2014) (comparing adaptation and mitigation, as defined by the Intergovernmental Panel on Climate Change.)

60. David Smiley, *Climate change 'the biggest challenge the city of Miami will ever face,' mayor says*, MIAMI HERALD (Mar. 24, 2017), <http://staugustine.com/2017-03-27/climate-change-biggest-challenge-city-miami-will-ever-face-mayor-says> [<https://perma.cc/DK9S-UY4S>].

61. See SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT COUNTIES, A REGION RESPONDS TO A CHANGING CLIMATE: REGIONAL CLIMATE ACTION PLAN (2012). The Southeast Florida Regional Climate Action Plan (RCAP) of October 2012 documents the coordinated mitigation and adaptation activities across Florida county lines. The Plan contains over 100 preparatory recommendations concerning the detrimental impacts of climate change.

62. Memorandum from Daniel J. Alfonso, City Manager, City of Miami, to Honorable Mayor and Members of the City Commission (July 19, 2017) (on file with author).

County-wide, Miami-Dade also has a major resiliency program. Its County Mayor, Carlos Gimenez, labels SLR a “very serious concern” for all South Florida, and “not a theory” but a fact: “We live it every day.”⁶³ It has been at the forefront since the County formed the first Climate Change Task Force in the region and subsequently joined in the formation of the four-county Southeast Florida Regional Climate Compact in January 2010.⁶⁴ The Task Force, in turn, set up a prestigious advisory Science and Technology Committee. The findings of the Committee are a core statement of the nature of the dynamic situation Southeast Florida’s floodplain is undergoing.

A. 2008: The Scientific Committee of the Miami-Dade Climate Change Task Force on SLR

The Science and Technology Committee of the Miami-Dade County Climate Change Task Force published a summary reported in 2008 connecting SLR specifics to local geographic and human consequences.⁶⁵ This well-credentialed Committee projected at least 3 to 5 feet of SLR by 2100. The report concluded that a 3 or 4 foot rise would mean “Developed Miami-Dade County as we know it will significantly change,” which would result in spring high tides of 6- to-7 feet or more.⁶⁶ Lost would be the County’s freshwater resources. The freshwater Everglades on the west side of the County would inundate with salt water. Barrier islands of the County would also inundate. Storm surges would be devastating. Landfill sites could erode and contaminate coastal waters. In addition, the Committee’s high-end projection of 5 foot rise could result in spring tides to nearly 8 feet or more.⁶⁷ At that level of SLR, “Miami-Dade County would be

63. Douglas Hanks, *Miami-Dade’s GOP mayor on sea-level rise: ‘It’s not a theory. It’s a fact. We live it every day.’*, MIAMI HERALD (Jan. 19, 2017), <http://www.miamiherald.com/news/local/community/miami-dade/article127251479.html> [<https://perma.cc/S8P8-LD5N>].

64. See SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT COUNTIES, *supra* note 60.

65. See SCIENCE COMMITTEE, MIAMI-DADE COUNTY CLIMATE CHANGE ADVISORY TASK FORCE, STATEMENT ON SEA LEVEL IN THE COMING CENTURY (2008).

66. *Id.* at 4.

67. See *id.*

extremely diminished.”⁶⁸ This brings forward many considerations with respect to legal response. The analysis says what the County now faces are “more challenging decisions than ever imagined.”⁶⁹ The Committee then set out recommendations useful and enduring in describing adaptation strategies.

The Committee called for urgent “reconsideration of nearly every aspect of the county’s management, zoning, infrastructure, and planning.”⁷⁰ The Committee’s recommendations take into account the full spectrum of water-related features of a low-elevation, heavily-populated, mainly urban setting. Specifically, the report noted that the County will need to document elevations of infrastructure elements and roadways; estimate erosion potential for coasts and wetlands; locate contaminated sites where SLR would potentially release pollutants; recalculate drainage changes (the area relies historically on a gravity-flow system of pipes, ditches, and canals augmented by pumps to remove storm water); recalculate storm surge risks to properties; assess structural viability of buildings and levees under changing groundwater levels and effects of saline water intrusion; and determine fresh drinking water sources for the future.⁷¹

Street flooding is a very disruptive condition that leads to stalled vehicles and often a chaotic daily routine. The projects, where feasible, become ones to alleviate many miles of streets. Local governments in Miami-Dade County expect to spend hundreds of millions of dollars on infrastructure to combat effects of SLR and severe rainfall events.⁷² The City of Miami Beach has a \$500 million project, with \$100 million to be spent in its first two years, to raise roads an average of two feet, install pumps, address water mains and move sewer connections to the front of homes.⁷³

68. *Id.*

69. *Id.*

70. *Id.*

71. *See id.*

72. David Smiley, *Miami Commission sends \$400 million general obligation bond to the voters*, MIAMI HERALD (July 27, 2017), <http://www.miamiherald.com/news/local/community/miami-dade/article164102937.html> [<https://perma.cc/UY6F-9K3V>] (finding about \$200 million of the general obligation bond allocated for flood and sea level rise infrastructure).

73. *See* Joey Flechas, *Miami Beach to begin new \$100 million flood prevention project in face of sea level rise*, MIAMI HERALD (Jan. 28, 2017),

Mayor Phillip K. Stoddard of South Miami remarked to the New York Times that by using planning and infrastructure repairs, the effects of SLR may be delayed, but the long-term fate of the coastal region is that “[u]ltimately we give up and leave.”⁷⁴ Defining the point when adaptation is no longer sufficient and retreat becomes necessary is elusive. Journalist Andres Oppenheimer of the Miami Herald indicates most scientists he has asked about the future of Miami Beach say “that this city won’t disappear under the water, nor will it become another Venice,” but absent global success in reducing global warming, “Miamians – as well as New Yorkers and residents of coastal cities everywhere – will have to pay much more in taxes to buy water pumps and other technologies that will be needed to lessen the impact of rising seas.”⁷⁵ Overall, there will be “a huge drain on the economy of rich countries, and an existential threat for poverty-ridden ones.”⁷⁶ In either event, the Regional Compact strives to lessen the impacts and avert retreat.

The Regional Compact is a remarkable collaboration between local governments. State and Federal government policy should support and complement their work, given the cost of disaster relief and the impact to economies of populated areas where precautionary preparations should never be lacking.

B. 2015: Innovative Efforts in Florida

As sea levels rises, or as scientists anticipate them to, both federal and local governments need to plan and convince the public to fund infrastructure projects to adapt and change practices that inaccurately plan the vertical and horizontal dimensions of SLR flooding. With the four counties 2010 Regional Compact cooperating and their following

<http://www.miamiherald.com/news/local/community/miami-dadc/miami-beach/article129284119.html> [https://perma.cc/5XVL-6H53].

74. Justin Gillis, *Flooding of Coast, Caused by Global Warming, Has Already Begun*, N.Y. TIMES (Sept. 3, 2016), <https://www.nytimes.com/2016/09/04/science/flooding-of-coast-caused-by-global-warming-has-already-begun.html> [https://perma.cc/XY24-EC34].

75. Andrés Oppenheimer, *I watched Al Gore wade through Miami Beach floods on-screen. Then the surreal happened.*, MIAMI HERALD (Aug. 9, 2017), <http://www.miamiherald.com/news/local/news-columns-blogs/andres-oppenheimer/article166217947.html> [https://perma.cc/RHV6-ZDRA].

76. *Id.*

implementation by the 2012 RCAP and the October 2015 Unified Sea Level Rise Projection, many resiliency efforts were quickly accomplished.

1. The Regional Compact's Unified Projection for SLR Compared to the Federal Definition of Floodplain for FFRMS

The Unified Projection aids regional planning with an understanding of potential vulnerabilities and develops risk-informed adaptation strategies.⁷⁷ It makes a standardized assumption for the range of sea level rise projections over time, with a wider range of uncertainty further in time. In effect, it could be seen as both a planning tool and a disclosure or advisory; the document is described as a “projection and guidance document . . . to be used for planning purposes by a variety of audiences and disciplines when considering sea level rise in reference to both short and long-term planning horizons and infrastructure design in the Southeast Florida area.”⁷⁸ As described below, SLR portends immense economic and social ramifications, and the Unified Projection addresses what is to be done by way of resilient adaptations, projecting out to 2100.⁷⁹ This guidance will assist major long range infrastructure and investments by government.

The Unified projection of October 2015 uses the 1992 baseline measurement of mean sea level (MSL) for a reference level.⁸⁰ By 2015, the mean sea level rise was 3 inches higher than the reference baseline value.⁸¹ By the 2030 planning horizon, the projection is 6 to 10 inches above the 1992 baseline.⁸² The 2060 projection is 14 to 26 inches above the 1992 mean sea level, and by 2100 the rise is projected to be between 31 and 61 inches over 1992.⁸³ In light of this, the Projection cautions that critical infrastructure designs over the next 50 years should plan for even higher estimates of 34 inches by 2060 and 81 inches in 2100.⁸⁴ The Unified Projection of 2015 concludes SLR

77. See SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT SEA LEVEL RISE WORK GROUP, UNIFIED SEA LEVEL RISE 1 (2015).

78. *Id.* at 2.

79. *See id.* at 13.

80. *See id.* at 4-8.

81. *See id.* at 13.

82. *See id.* at 4.

83. *See id.*

84. *See id.* at 6.

values close to the levels reported in the 2008 Miami-Dade Science and Technology Committee report.⁸⁵ The local governments, linked by Compact to cooperate, successfully informed elected officials and the public about a common hazard via their RCAP and Unified Projection report. The next goal was to identify practices that may deliver solutions, and then, via the 2015 legislation relating to the peril of flooding, to build the solutions into binding restrictions and standards in comprehensive planning.

Even government officials on the State or Federal level that may question whether or to what extent humans are responsible for SLR cannot afford to ignore known trends in establishing risk decisions. The Regional Compact used a climate science-based projection. The 2015 version of the floodplain definition for federally funded projects offered a climate science-based definition, or alternatively per se higher vertical elevations of two or three feet, or a 500-year flood. The revocation of the 2015 version in 2017 returned to the lower, and less flexible, 100-year-flood criteria for the projects. The local government implementation meanwhile established its approaches to an advanced level.

2. Planners Create a Tool-kit of Florida Adaptation Actions

Florida planning and permitting is well established. Florida SLR adaptation approaches owe a great deal to the State's decades-long local comprehensive planning and growth management laws. These traditional approaches establish the densities and intensities of land use, and provide for orderly development.⁸⁶ Elements of these local plans include coastal zone elements that map and plan coastal high-hazard areas;⁸⁷ conservation elements that require identification of wetlands, estuarine marshes, and environmentally sensitive lands;⁸⁸ and capital improvement elements that identify drainage, sewer, potable water, and road plans along with the level of services.⁸⁹

85. See SCIENCE COMMITTEE, *supra* note 65, at 3.

86. See generally FLA. STAT. § 163.3161 (2016) ("Community Planning Act").

87. See e.g., FLA. STAT. § 163.3177(6)(g) (2016) (addressing the coastal zone element); see also FLA. STAT. § 163.3178(2) (2016) (same).

88. See FLA. STAT. § 163.3177(6)(d) (2016) (addressing the conservation element).

89. See FLA. STAT. § 163.3177(3)(a) (2016) (addressing the capital improvement element).

Professor Richard Grosso critically surveys a number of laws and programs that are implicated in SLR and climate change. These include comprehensive planning aspects and important permitting programs. Discussed are coastal construction control and the 30-year erosion protection line (which concerns sandy beaches), permit programs regarding seawalls and other coastal armoring, and re-nourishment permits for critically eroded beaches.⁹⁰ These and other core environmental permit programs play a pivotal role in implementing SLR strategies relating to wetlands and water quality issues, species protection, conservation lands, growth management, and infrastructure provisions.

Implementation of choices regarding SLR involves not only the traditional controls described above, but also additional mechanisms that can be used in conjunction. SLR tools were developed so adaptation could go beyond the traditional, long-standing comprehensive planning mechanisms in use across the state. Specifically, the 2015 South Florida Regional Planning Council Guidebook presented a set of project planning tools. The tools are intended to assist local governments with overall comprehensive planning.⁹¹ The Guidebook proposes a step-like structure for weighing the variables in particular adaptation proposals. The seven variables for consideration concern social acceptability, technical feasibility, implementation by community leadership, political acceptability, legal implementation, cost-effectiveness, and environmental favorability. In its 16-item Adaptation Strategies Tool-kit, the Guidebook then suggests how to implement projects via funding and scheduling.⁹²

Tool-kit topics include expanding building code and floodplain regulations, a concept for SLR transfer of development rights, rebuilding restrictions, real estate disclosures, and financing for stormwater utility projects.⁹³ The traditional local comprehensive

90. See Richard Grosso, *Planning and Permitting to Reduce and Respond to Global Warming and Sea Level Rise in Florida*, 30 J. OF LAND USE & ENVTL. L. 201, 203 (2015).

91. See SOUTH FLORIDA REGIONAL PLANNING COUNCIL, ADAPTATION ACTION AREAS: A PLANNING GUIDEBOOK FOR FLORIDA'S LOCAL GOVERNMENTS (2015).

92. See *id.* at 50-60; see also David L. Markell, *Emerging Legal and Institutional Responses to Sea-Level Rise in Florida and Beyond*, 42 COLUM J. ENVTL. L. 1, 12 (2016) (discussing Adaptation Action Area legislative creation).

93. See SOUTH FLORIDA REGIONAL PLANNING COUNCIL, *supra* note 91, at 50.

planning tools are generally addressed in permitted uses and intensities, zoning codes, land use classifications, setbacks and buffers, impact fees, and dedications. These offer the traditional framework onto which implementation strategies from the Tool-kit can be built.

The Tool-kit's suggestions to revise building codes and floodplain requirements offer an explicit tool for local governments. Localities can make stronger local amendments based on individual conditions under the Florida Building Code.⁹⁴ These could extend "flood resistant building code standards to currently unregulated areas that may become vulnerable to flooding in the distant future, such as the 500-year floodplain."⁹⁵ In tidally influenced floodplains, local terms could require "two or more feet of freeboard" to elevate structures, and expand use of flood-resilient construction materials in new or redevelopment buildings into additional vulnerable terrain.⁹⁶ These suggestions were made after, and are similar to, those of Executive Order 13690. However, they project heightened and resilient standards akin to the federally funded projects definition of floodplain from Executive Order 13690 into the Building Code tool for improved development standards. The FFRMS are not standards controlling private development, nor are the FFRMS associated with flood insurance. For instance, the Tool-kit noted that in the National Flood Insurance Program (NFIP), 100-year floodplains are classified as A-Zones and V-Zones, while 500-year floodplains are in X-Zones with the latter not mandatory, but are encouraged in the local-use Tool-kit.⁹⁷ Floodplains are currently mapped in the Flood Insurance Rate Maps (FIRMs). However, the Tool-kit notes that the FIRMs are created from only historical flood data, which does not include projected sea level rise impacts. Thus, because of inherent inaccuracy of historical data on flood levels and future projection of rise of level of inundation, the Tool-kit suggests "higher standards on development in floodplains above the NFIP minimum standards."⁹⁸ For example, a "use" restriction to limited residential or recreational or agricultural uses may be suitable as a decreased intensity of permitted uses.⁹⁹

94. Fla. Bldg. Code § 202 (2017) (defining "flood hazard area").

95. SOUTH FLORIDA REGIONAL PLANNING COUNCIL, *supra* note 91, at 55.

96. *Id.*

97. *Id.* at 55-56.

98. *Id.* at 56.

99. *Id.* at 57.

Another concept from the Tool-kit is the Transfer of Development Rights (TDR). TDR is presented with explanations and cautions. One suggestion provided in the Tool-kit is that communities could develop a “sea level rise TDR program” on a regional or statewide scale.¹⁰⁰ It proposes that a property owner who relinquishes development rights in the “sending” area where SLR risks exist would then be able to add development beyond what would normally be allowed in a “receiving” area elsewhere.¹⁰¹ This would spur participation and create a surplus of options for receiver sites. The receiving area necessarily is one where “development permits must be in high demand and limited.”¹⁰² Indeed, there are positive examples of TDR in the Florida Keys and in wetlands and conservation areas. In the Keys, densities are shifted from some of the sensitive sites in the lower and middle Keys to supplement allowable single-family densities and floor-areas of commercial development in some middle and upper Keys receiving areas.¹⁰³ Achieving participation and striking deals to establish sending and receiving areas raises many issues, such as why receiving areas do not already allow the increased densities.¹⁰⁴ But the Tool-kit’s suggestion of a large-scale regional or statewide program for sea level rise TDRs may be the scale needed for success. Many areas across the state could be eligible for “sending” designation under the floodplain mapping of future SLR. In fact, many local governments have already identified future growth locations in their planning to encourage well located redevelopment or new development.

Overall, the Tool-kit encourages better approaches to adapting to SLR. These tools combine with ongoing and future physical improvements that resist effects of SLR. Costly new stormwater drainage and pumps, seawall heightening, and the road-elevating projects are ongoing in the region, but the tools presented in the Tool-kit are additional resources available for the required 7-year SLR updates to local government comprehensive plans.

Nonetheless, the irony continues. While federally funded projects are relying on antiquated base floods that miss the vertical and horizontal dimensions of the floods, local governments are utilizing

100. *Id.* at 51-53.

101. *Id.*

102. *Id.* at 51.

103. *Id.* at 52.

104. SOUTH FLORIDA REGIONAL PLANNING COUNCIL, *supra* note 91, at 51-53.

the Tool-kit to learn how to confront the actual impacts of SLR in Florida as they make mandatory planning revisions.

3. The “Peril of Flood” Statute

Florida legislative leadership has been reticent to embrace a human causative relationship to SLR, but that does not mean Florida does not accept SLR as a problem. In 2015, legislators turned the optional SLR planning that existed since 2011 into a mandatory planning consideration for coastal counties.¹⁰⁵ This means that in coastal counties, which are required to have a coastal element in their comprehensive plans, consideration of SLR must be included in the coastal element.¹⁰⁶ The provision requires the element contain a:

redevelopment component that outlines the principles that must be used to eliminate inappropriate and unsafe development in the coastal areas when opportunities arise. The component must: (1) 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.¹⁰⁷

This addition is part of a measure that can be referred to as the “peril of flood” law, due to the use of the phrase in the opening sentence of Chapter 2015-69, Laws of Florida.¹⁰⁸

Local governments are required to update their comprehensive plans at a minimum in 7-year cycles.¹⁰⁹ A consistency clause, part of the long-standing system of Florida comprehensive planning, requires local development approvals to comply with the plan.¹¹⁰ The Unified Projection ties into the comprehensive plan requirement as modified by the “Peril of Flood” Act of 2015, in that the Act makes county

105. FLA. STAT. § 163.3178(2)(f)(1) (2017).

106. *Id.*

107. *Id.*

108. Markell, *supra* note 95, at 18.

109. Markell, *supra* note 95, at 18-20.

110. FLA. STAT. § 163.3194 (2017).

planning described in the Unified Projection, mandatory for sea level rise. Thus, the Act and the Unified Projection are ready to fit into local comprehensive plans during the regular update cycles.

Despite these local efforts, the now revoked federal floodplain definition means that the Federal government is drastically out of step with local SLR planning. This negates the federalism concepts embodied by the Federal Coastal Zone Management Act (CZMA) itself. The Congressional findings of the CZMA about SLR state “[B]ecause global warming may result in a substantial sea level rise with serious adverse effects in the coastal zone, coastal states must anticipate and plan for such an occurrence.”¹¹¹ The purposes of the CZMA refer several times the Act’s intent for management that is responsive to sea level rise.¹¹² Ironically, it was a Florida Department

111. 16 U.S.C. § 1451 (2017) at (l).

112. The purposes of the Federal Coastal Zone Management Act include:

(2) to encourage and assist the states to exercise effectively their responsibilities in the coastal zone through the development and implementation of management programs . . . which should at least provide for . . .

(B) the management of coastal development to minimize the loss of life and property caused by improper development in flood-prone, storm surge, geological hazard, and erosion-prone areas and in areas likely to be affected by or vulnerable to *sea level rise*, land subsidence, and saltwater intrusion, and by the destruction of natural protective features such as beaches, dunes, wetlands, and barrier islands . . .

(K) the study and development, in any case in which the Secretary considers it to be appropriate, of plans for addressing the adverse effects upon the coastal zone of land subsidence and of *sea level rise*; and

(3) to encourage the preparation of special area management plans which provide for increased specificity in protecting significant natural resources, reasonable coastal-dependent economic growth, improved protection of life and property in hazardous areas, including those areas likely to be affected by land subsidence, *sea level rise*, or fluctuating water levels of the Great Lakes, and improved predictability in governmental decisionmaking”

16 U.S.C. § 1452(2)-(6) (emphasis added).

of Economic Opportunity grant under the CZMA that supported the South Florida Regional Planning Council's 2015 adaptation project that set up the SLR planning tools now available or being implemented by local governments under Florida's "Peril of Flood" Act.¹¹³

Given the findings and purposes of the Federal CZMA with regard to SLR, the floodplain recognitions that should exist for federally funded projects are the ones now revoked. Should the local comprehensive planning route using the Tool-kit or other adaptation activities fall short in providing resilience, examination of the level of tolerance becomes increasingly important.

C. Some Future Date?: Finding the Local Level of Tolerance of Inundation and Deciding to Retreat

Adaptation is often called in more positive or hopeful terms "resilience."¹¹⁴ The resilience movement seeks ways to adjust, at least for a period of time, to changes. It is often due to an urgency related to declined habitability (a classic being hurricanes) or foreseeable destruction that will be suffered in the short-term (*i.e.* within the next 50 or 100 years).¹¹⁵ Sea level rise is likely to be accelerating rather than gradual as many factors are involved, from global processes, acceleration of ice melt, warm currents, thawing permafrost, vertical movement of land, and ocean circulation alter the rate.¹¹⁶ For the near-shore lands, in addition to SLR are storm surges, "king" or spring tides, and the added contribution of rainfall. These events affect planning beyond the benchmark mean sea level projections.¹¹⁷ While curbing climate change has spawned organized opponents to mitigation of greenhouse gas emissions, there seems to be less organized opposition

113. SOUTH FLORIDA REGIONAL PLANNING COUNCIL, *supra* note 91, at 3.

114. FEMA, *supra* note 21, at 9. FEMA's Guidelines define "Resilience" as the ability to adapt to changing conditions and withstand and rapidly recover from disruption due to emergencies.

115. *Id.* in the Glossary for example at 6, flood chances are related to time ranges like one chance in 100 of the level being equaled or exceeded in any one-year period.

116. SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT SEA LEVEL RISE WORK GROUP, *supra* note 77 at 26-33.

117. *See* SOUTH FLORIDA REGIONAL PLANNING COUNCIL, *supra* note 91, at 9 for descriptions of key words related to the variety of high-tide events.

to the call for local adaptation,¹¹⁸ although specific local proposals and costs of resiliency projects generate debate among stakeholders.¹¹⁹

As with response to any public hazard, local SLR resilience movements deserve appropriate and forward-moving public support. To fund sensible projects that will defer the effects on humans and nature is crucial. But the ultimate fate is that SLR will continue for many decades – and probably centuries – due to past greenhouse gas emissions.¹²⁰ The field of climate change law is divided into two branches, mitigation and adaptation. Mitigation is prevention or lessening of the emissions, addressed to the very causes of the human-induced portion of climate change.¹²¹

More mitigation eventually reduces the need for adaptation in the very long term.¹²² By contrast, adaptation or resilience seeks ways to adjust, at least for a period of time, to the changes mitigation does not reach as rapidly as needed.¹²³ Any vulnerable area could be the starting place for analysis, such as locations impacted by the most expensive hurricanes to strike the United States combining wind and flood impacts, variously reported to be Hurricanes Harvey, Katrina, Irma, and Sandy. But for preparation against the gradual SLR onslaught, Miami, Florida and vicinity rank highly vulnerable.

Various descriptive scenarios describe when the individual or collective limit to normal habitability of an area reaches a turning point, where tolerance levels are exceeded and migration or relocation is deemed necessary. Two SLR studies by the Union of Concerned Scientists (UCS) are helpful to express the tolerance dilemma. The first UCS report describes decision-points for military bases on the East and Gulf coasts.¹²⁴ The second UCS report expanded its concepts to detail how SLR affects communities generally.¹²⁵ The UCS study of SLR

118. Parker-Flynn *Supra* note 59 at 8.

119. *Id.*

120. SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT SEA LEVEL RISE WORK GROUP, *supra* note 77, at 36-33.

121. Parker-Flynn note 59 at 6, defining mitigation and adaptation.

122. *See id.* at 26.

123. *See* SOUTHEAST FLORIDA REGIONAL CLIMATE CHANGE COMPACT COUNTIES, *supra* note 61, at 23-26 (addressing both mitigation and adaptation extensively and in intertwined ways).

124. *See* ERIKA SPANGER-SIEGFRIED ET AL., THE US MILITARY ON THE FRONT LINES OF RISING SEAS (Union of Concerned Scientists ed., 2016).

125. *See id.*

effects on 18 military installations on the American East and Gulf coasts considered levels at year 2050 and year 2100. It used both “intermediate-high” SLR assumptions of 3.7 feet for the year 2100 (compared to the year 2012 baseline level) and a “high” assumption of a 6.3 foot SLR as particularly useful for decisions about military bases due to the low tolerance for risk at base locations.¹²⁶ The criteria USC used for analyzing SLR effects on military bases defined “land loss” as “[L]and that is inundated by at least one high tide each day.”¹²⁷ This was called a “conservative metric: in reality, far less frequent flooding would lead to land being considered unusable.”¹²⁸

The report concluded that much of the Naval Air Station Key West is considered to be a future loss by 2050 due to daily flooding.¹²⁹ A similar analysis of the Langley Air Force Base in Hampton, Virginia by Paul Hawkins references the effects of Hurricane Isabel in 2008. There, 200 facilities had damage, and repair bills were \$166 million from massive flooding that was “a whopping” 7.9 feet above tidal level.¹³⁰ The Base has since installed flood barriers, storage, pump systems, and elevated electrical equipment as adaptations.¹³¹ However, with SLR, many of the commands at Langley could be reassigned inland, and the Base should be scrutinized for closure, absent Congressional efforts to aid adaptation.¹³²

Tidal flooding events outside of military bases may implicate “impassable roads; flooded residential, industrial, and commercial areas; and damaged facilities, automobiles, and other machinery.”¹³³ Tolerance to conditions may for some be reflected in whether flood water destroys vehicles. Hurricanes Katrina and Rita brought attention to the issue, with buyers of water-damaged and salvaged cars being cautioned to look for signs of flood damage. Professor Jeremy A. Ball explains the difficulties detecting flood damaged and salvaged

126. *See id.* at 2.

127. *See id.* at 3.

128. *Id.* at 4.

129. *See* SPANGER-SIEGFRIED ET AL., *supra* note 124, at 5.

130. Paul Hawkins, *Waging War on the Rising Seas: Fashioning a Comprehensive Approach to Combating the Effects of Sea Level Rise on Hampton Roads, Virginia Military Installations Under Existing Frameworks*, 41 WM. & MARY ENVTL. L. & POL’Y REV. 265, 266 (2016).

131. *See* SPANGER-SIEGFRIED ET AL., *supra* note 124, at 4.

132. *See* Hawkins, *supra* note 130, at 294.

133. SPANGER-SIEGFRIED ET AL., *supra* note 124, at 3.

vehicles. Flooding may be detectable from signs like damaged electrical components, presence of rust, silt, or corrosion, musty smells, trapped moisture, or mismatched carpets.¹³⁴ While states vary on standards for issuance of new titles when insurance companies declare total loss to a flood-damaged vehicle, almost all states require “branded” titles be issued when damage exceeds a percent of the retail value, to mark with a salvage or flood damage disclosure the required new titles after insurance settlements. However, violations or loopholes in the salvaged vehicle disclosure system persist although there are search links for services consumers can use to research vehicle history.¹³⁵

Though flooded vehicles and roads are one sign the SLR turning point has been reached, it could be when toleration of periodic inundation brings an end to habitability. The UCS report in 2017 sets out terminology to describe the circumstances where loss of habitability occurs.¹³⁶ Decline of habitability may reach a “threshold for sea level rise-induced flooding that can disrupt peoples’ routines, livelihoods, homes, and communities.”¹³⁷ The report offers the term “chronic inundation” as a general condition of destroyed habitability.¹³⁸ The UCS report explains its general proposition that chronic inundation is flooding of over 10 percent of a coastal community land area (excluding wetlands and federal levee-protected areas) with a frequency averaging once every other week.¹³⁹ Somewhere in this setting “hard choices” are triggered as normal routines become impossible.¹⁴⁰ When is it that the proverbial last straw breaks the camel’s back? A sudden dramatic event often fixes in the mind a need to change, to make the individual or collective decisions. Circumstances of decline like depressed property values erode community structure. If the projections of the rate of SLR are accurate – the UCS uses intermediate, high, and extreme scenarios to select

134. See Jeremy A. Ball, *Flood Damaged and Salvaged Automobiles Threaten Consumer Woes: Hurricanes Katrina and Rita & the \$40 Million State Farm Insurance Settlement*, 2005 ARMY L. 40, 44 (2005).

135. See *id.* at 45.

136. See SPANGER-SIEGFRIED ET AL., *supra* note 124, at 1.

137. *Id.*

138. *Id.*

139. See *id.*; see also *id.* at 6. The significance of frequency varies between urban and rural locales and there is no magic number for a community.

140. See *id.* at 29.

from, dependent on the tolerance for risk of the persons involved – then at least realistic choices may be made about trying to be resilient or migrating out. Nevertheless, some policies favor staying when perhaps they should not.

Destruction of federally funded projects during high water events due to insufficiently built-in resilience can compound the effects and cause communities to lose their tolerance for risk. Federally funded projects such as those listed in the 2015 Guidelines could be affected in the Southeastern Florida region. New, substantially improved or substantially damaged bridges, roads, buildings, utilities, and storage tanks,¹⁴¹ if built to insufficient elevations or resiliency for future SLR, place communities and the regional welfare at risk, perhaps past the “chronic inundation” threshold of disruption.

III. PREPARING FOR THE FUTURE

Discussed are: (A) the role for flood insurance reform; (B) how out-migration also needs planning; (C) economic disruption perspective; (D) social fairness in the planning; (E) the changing legal environment; and (F) policy dilemmas.

A. FFRMS are not Flood Insurance Reforms

Reform is needed to the current flood insurance system that supports “flood, rebuild, repeat.” This is a national concern but especially critical in flood-prone locations at the coastlines nationwide and on interior river floodplains mainly in the Eastern half of the United States.¹⁴² Under terms currently honed out by back-and-forth Congressional reforms made in 2012 and 2014, the National Flood Insurance Program (NFIP) still, according to Professor Jennifer Wriggins, provides “generous subsidies to flood-prone properties.”¹⁴³

Professor Wriggins chronicles many details of flood insurance and suggests how to phase out certain subsidies while including a limited

141. See FEMA, *supra* note 21, at 7-9. The FEMA Guidance document definitions of facility, federally funded projects, and structures are subject to the FFRMS.

142. Lucas Eastman, *Flood, Rebuild, Repeat: The Need for Flood Insurance Reforms*, NAT'L RESOURCES DEF. COUNCIL (Aug. 11, 2016), <https://www.nrdc.org/experts/rob-moore/flood-rebuild-repeat-need-flood-insurance-reforms>.

143. Jennifer Wriggins, *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*, 119 PENN ST. L. REV. 361, 361 (2014).

affordability plan for qualified persons in economic need.¹⁴⁴ But changes would increase insurance rates for many, and so, despite the merits of reform that would cause rates to better coincide with risk, much reform has had to wait.¹⁴⁵ The Natural Resources Defense Council (NRDC) blog calls the insurance program a “flood, rebuild, repeat” system and describes the magnitude of the problem of “Severe Repetitive Loss Property.”¹⁴⁶ The NRDC statistics describe more than 30,000 properties nationwide that have flooded more than 10 times, only to be paid by NFIP to rebuild after each flood.¹⁴⁷ Projecting to the year 2100, SLR could inundate between 4 and 13 million homes, and so changes are needed in the National Flood Insurance Program which “is designed to help people rebuild in the same location where they were flooded,” at enormous cost to the program that encourages “Severe Repeater” waste of resources.¹⁴⁸

Although flood insurance is large-scale, in application, the claims can pose novel questions. An example arose at a Miami Beach restaurant situated on a street where elevation was raised for City SLR adaptations to tidal floods.¹⁴⁹ Six anti-flooding pumps were installed as part of the \$400 million plan of street-raising and installations of 80 pumps to combat SLR. But in a heavy rain during high tide on October 3, 2016, only one of the six pumps functioned, due perhaps to nearby construction or to repairs, and as a result, the area flooded.¹⁵⁰ After applying to the National Flood Insurance Program, adjustors for the Program were faced with the question of how to interpret guidelines for the restaurant. Specifically, adjustors had to determine whether to deem the property a “basement” because it now stood below the street’s new ground level after the adaptation measures were implemented. Therefore, part of the structure may have fallen outside the program’s coverage.¹⁵¹

144. *See id.* at 421.

145. *See id.* at 420-21.

146. Eastman, *supra* note 142, at 2.

147. *See id.* at 2-3.

148. *See id.* at 3.

149. *See* Joey Flechas, *Flood claim denied for restaurant turned basement’ after Miami Beach raised street*, MIAMI HERALD (Nov. 17, 2016), <http://www.miamiherald.com/news/local/community/miami-dade/miami-beach/article115264938.html> [<https://perma.cc/CT5D-KB4Y>].

150. *See id.*

151. *See id.*

There is also a risk of severe repetitive loss of federally funded infrastructure projects, just as with insured properties. Inadequate federal resilience standards or repair for new structures and facilities could be responsible for losses due to SLR. While flood insurance reform has difficulty getting legislative approval due to its effect on rates, the FFRMS has no such counter-movement (presumably) because it is for federally funded projects and no insurance premium affects it. But, while the 1977 version of FFRMS leave Federal projects in the same “flood, rebuild, repeat” mode, consumer insurance costs are not involved and so with no constituency of opponents, it should be relatively easy to pass the restoration of the 2015 FFRMS reforms. Unfortunately, the public may already be literally moving on to more flood-protected localities due to the chronic inundation they face or anticipate from SLR projections.

B. Organizing for Out-Migration in Retreat from SLR

Projections of migration away from impacted areas are another measure of the point where conditions can evolve from “resilient” to “give up and leave.” A study by demographer Matthew E. Hauer assumes a 1.8 meter rise in sea level (5.9 feet) from the baseline year 2010 to the year 2100.¹⁵² For this period Hauer gathered published estimates of county-level projected populations at risk to SLR. Using county-to-county population projections and migration flow data from the Internal Revenue Service, a projected migration system was created for all affected coastal counties.¹⁵³ Hauer concludes Florida is the most affected state by population losses. It could lose more than 2.5 million in net population due to the SLR.¹⁵⁴ Though he notes adaptation measures such as sea walls, beach nourishment, pumps, home elevation, or raising roads are being implemented, he assumes some type of adaptation, rather than migration, is more likely for households earning over \$100,000 annually.¹⁵⁵ Louisiana, he calculates, is the second most affected state. He estimates a loss of about half a million people from SLR-caused migration.¹⁵⁶ Because

152. Matthew E. Hauer, *Migration induced by sea-level rise could reshape the US population landscape*, 7 *NATURE CLIMATE CHANGE* 321, 321 (2017).

153. *See id.*

154. *See id.* at 322.

155. *See id.*

156. *See id.* at 3.

Southeastern Florida and Louisiana are at the top of the displaced population list, this suggests the need for the most responsible precautions to ensure federally funded structures and facilities in the region are adequate to protect against human suffering, both physical and economic.

Hauer's work details how population distribution from displacement will spread widely across the United States, potentially adding 250,000 new residents to the Orlando area and 1.5 million new residents to Texas. He cautions that the additions are likely omitted from current planning in the receiving geographic areas.¹⁵⁷ In addition, global projections are that 500 million people may exit the Middle East and North Africa by the end of the century, per predictions of the lost habitability due to climate change.¹⁵⁸

D. Economic Disruption at Ports

Globally, SLR and storm surge adaptation infrastructure may in the future cost \$421 billion annually. In the United States, adaptive infrastructure for SLR combined with storm surge may have a cumulative price tag of approximately a trillion dollars.¹⁵⁹ These numbers express the seriousness of the subject in terms of financial impact.

The Organization for Economic Co-operation and Development (OECD) studied effects on the world's major port cities.¹⁶⁰ Considered were coastal flooding due to storm surge and damage due to high winds to exposed populations and exposed assets. The study reveals the economic dimensions present even in 2005, noting that both populations and assets could grow over threefold by 2070 (also an impressive number).¹⁶¹ OECD found the top ten major cities in the world in terms of exposed assets are Miami (rated number one), Greater New York (second), New Orleans (third), and Tampa-St.

157. *See id.* at 324.

158. *See id.* at 324-25.

159. *See id.* at 322; *see also* James E. Neumann et al., *Joint effects of storm surge and sea-level rise on US Coasts: new economic estimates of impacts, adaptation, and benefits of mitigation policy*, 129 CLIMATE CHANGE 337 (2015).

160. *See* R. J. Nicholls et al., *Ranking Port Cities with High Exposure and Vulnerability to Climate Extremes: Exposure Estimates 3* (OECD Environment, Working Paper No. 12008).

161. *See id.*

Petersburg (ninth) and Virginia Beach (tenth).¹⁶² Also, OECD reports that in terms of population exposure, Miami, Greater New York, and New Orleans are in the top 10 as of 2005.¹⁶³ The global list of populations exposed is headed by Mumbai, Guangzhou, and Shanghai.¹⁶⁴ The OECD concludes that “[T]he policy implications of this report are clear: the benefits of climate change policies – both global mitigation and local adaptation at the city-scale – are potentially great.”¹⁶⁵ The report predicts “even assuming protection levels will be very high everywhere in the future . . . the exposure . . . is likely to translate into regular city-scale disasters across the global scale.”¹⁶⁶

The 2015 Guidelines for the revoked FFRMS address ports and other disrupted facilities when considering whether a proposed action is a “critical action” for floodplain resilience, with the description of “critical action” in Executive Order 13690 being “any activity for which even a slight chance of flooding would be too great.”¹⁶⁷ Critical actions are provided for in the alternative floodplain definition that adds 3 feet to the base flood elevation, compared to 2 feet for non-critical ones.¹⁶⁸ To determine whether an action is a critical action, the Guidelines pose the following question: “Would essential or irreplaceable resources, utilities, or other functions be damaged beyond repair, destroyed, or otherwise made unavailable?” The answer provided in the Guidelines is illustrated by examples, such as:

Would the damage or disruption from a local flooding event lead to regional or national catastrophic impacts (e.g., a port being closed for a period following a storm event, which has an impact on transportation of goods nationally)?

Would damage or disruption to a given facility or infrastructure component have potential for cascading damage or disruption to other facilities and infrastructure classes, some of which may already be stressed by flood conditions (e.g., electricity outage due to substation

162. *See id.*

163. *See id.*

164. *See id.*

165. *Id.*

166. *Id.*

167. *See* FEMA, *supra* note 21, at 39.

168. OFFICE OF THE PRESS SECRETARY, EXECUTIVE ORDER - ESTABLISHING A FEDERAL FLOOD RISK MANAGEMENT STANDARD AND A PROCESS FOR FURTHER SOLICITING AND CONSIDERING STAKEHOLDER INPUT (2015).

damage resulting in wastewater treatment facility shutdown or gasoline pump outage)?¹⁶⁹

If the answers to these inquiries is yes, the action is considered to be a critical one. In that case, agencies are to seek practicable alternatives to locating the floodplain, and if there are none, (as would be expected for most ports) agencies are to determine the impact and minimize, restore, and preserve as needed to address the ways to minimize the impacts.¹⁷⁰ That is, special considerations are added, beyond elevation, to address resiliency in critical areas under the revoked definition.

In the approximately 10-year experience of Southeastern Florida since the 2008 scientists Committee statement to the Miami-Dade County Climate Change Task Force, much has been done. The Regional Climate Compact formed and made its Unified Sea Level Rise Projection, planners identified adaptation methods, and local governments are busy implementing adaptations. The upcoming work in local comprehensive plans under the “peril of flood” statute is a wonderful piece of progress. But, given what is at stake economically, the challenge is fairly raised: is it good enough and fast enough? Taking a step backwards on a standard for any type of project needed to protect the valuable assets of a port would seem foolhardy. However, not all who face the inundation from SLR are reasonably situated to cope.

E. Social Fairness in Adaptation and in Out-Migration

Achieving fairness in adaptation should address social issues such as populations of poorer, elderly, disabled, renters, or persons in outdoor occupations. These individuals may be badly situated to react appropriately. Should a lower-income community be protected or abandoned? How able are residents to prepare, flee, find shelter, or locate affordable housing? Should policies seek to relocate these vulnerable communities and individuals, amidst decline of livable conditions? Can public assistance programs extend to meet the challenge?¹⁷¹

169. See FEMA, *supra* note 21, at 39.

170. See *id.* at 39.

171. See Alice Kaswan, *Domestic Climate Change Adaptation and Equity*, 42 ENVTL. L. REP. 11125 (2012).

In dealing with such questions, seven principles directly or indirectly addressing equity considerations are put forward by Professor Alice Kaswan. The principles address the disadvantages faced to suggest the design of solutions. For instance, the principle that government rather than private action alone is needed, and tailoring responses such as for those in need of affordable housing in safe areas. The suggestion is made that a comprehensive agenda is needed to deal with the pervasive issues involved.¹⁷² The scope of Kaswan's principles is extensive and they might inform legislation on adaptation, as well as disaster management, housing agencies, public health organizations and local governments.¹⁷³ These are additional considerations for the "peril of flood" revisions to the coastal zone elements of local Florida comprehensive plans that tie into the affordable housing aspects of comprehensive planning. Florida should take the opportunity to develop its policies and devise assistance programs with foresight and consideration to equity principles. The benefit of being kept outside the at-risk horizontal dimension of the floods, or being resiliently designed for social assistance efforts such as federally funded nursing homes, hospitals, and utilities, seems fundamental.

F. Changes in the Legal Environment

What is relevant for lawyers in daily practice in considering SLR? Suggestions are compiled by Professors Marc L. Miller and Jonathan T. Overpeck. Climate change is or will have "pervasive impact on a broad swath of legal practice."¹⁷⁴ Much has to do with mitigation as companies turn "green," and regulations on emissions pressure changes from the "old" to "new" energy sources.¹⁷⁵ Some has to do with litigating "claims of direct harm from promotion of fossil fuels

172. See Alice Kaswan, *Adapting to Climate Change in the United States – Seven Principles for Achieving Fairness*, CENTER FOR PROGRESSIVE REFORM (2017), http://www.progressivereform.org/SustainableDevelopmentIssueAlert_Kaswan.cfm.

173. See *id.*

174. Marc L. Miller & Jonathan Overpeck, *Climate Change and the Practice of Law*, 47 ARIZONA ATT'Y 30, 32 (2010).

175. See *id.* at 31.

and suppression of evidence of harm from global warming” in actions akin to the cigarette companies’ settlement with states.¹⁷⁶

Miller and Overpeck list many areas of legal practice affected climate change, for instance, “general business, real estate, insurance, land use, public utilities, state and local law, transportation, as well as power and water.”¹⁷⁷ Legal tools to manage risks will be applied, “including the building blocks of contract, tort law, property, and insurance” that should shift due to the changes in the nature of the risks.¹⁷⁸ Rather than assuming matters such as water supply allocations between urban, agricultural, and natural areas will be relatively stable, the former assumptions about flow will necessitate reallocation among stakeholders. Planning for climate change may implicate “every real estate, land use, transportation, state and local government and finance practice.”¹⁷⁹ Disclosure of risks from climate change and its consequences are obligations of publicly traded companies under the United States Securities and Exchange Commission’s 2010 guidance.¹⁸⁰ Governmental scale concerns for law are implicated with extremes of drought and flood, leading to renewed water allocation disputes.¹⁸¹ Liabilities to municipal and county entities for affirmative acts and against governments for failure to act may be cognizable claims.¹⁸²

In Florida, it is not settled whether responsibility to undertake adaptation for flood control is a discretionary decision or a duty of local governments. Thomas Ruppert and Carly Grimm posit the costs “will only rise with the waters, potentially drowning local governments in rising debt if not rising water.”¹⁸³ The duty-versus-discretionary aspect may involve whether SLR should be considered as within legislative discretion of local governments as “upgrades.”¹⁸⁴

176. *Id.* at 37.

177. *Id.* at 31.

178. *Id.* at 34.

179. *Id.* at 36.

180. *See* Miller & Overpeck, *supra* note 174, at 37.

181. *See id.* at 34.

182. *See id.* at 35.

183. Thomas Ruppert & Carly Grimm, *Drowning in Place: Local Government Costs and Liabilities for Flooding Due to Sea-Level Rise*, 87 FLORIDA BAR J. 29, 29 (2013).

184. *See id.* at 32.

There is another open question in Florida as to how the coastal counties address the costs of SLR, or whether certain costs should be made a statewide obligation. Richard O. Jacobs and Steven M. Hogan describe adaptation financing as a key component for communities, and ask “what happens if a coastal community’s tax base erodes due to falling coastal property values and decreased tourism?”¹⁸⁵ They suggest a state-level “super fund” to assist, and describe adaptation revenue mechanisms for cities such as those included in a City of Coral Gables white paper, which examines Ad Valorem taxation, special assessments, user and utility fees, municipal bonds, grants, subsidies, public-private partnerships, municipal risk financing, and other localities’ revenue methods.¹⁸⁶

G. Policy Dilemmas and Comparisons

As Professor Sarah J. Adams-Schoen sets out, even the laudable and far-reaching leadership of New York City initiatives on adaptation face “a host of wicked policy binds.”¹⁸⁷ As the conditions of the climate with its rising seas continue to accelerate, the New York City area has a massive population facing disruption and levels of government do not coincide on the reality of the situation, much less the remedial measures and their costs. One policy bind is a “toughness” theme in the New York City sustainability program public outreach that may convey a false sense of security of both the scope of SLR and what protective measures can even achieve.¹⁸⁸ Adaptation assumptions are built on the tenuous prospect that the mitigation efforts to reduce developed country greenhouse gas emissions by 80% from 1990 levels by 2050 will be achieved.¹⁸⁹ Moreover, New York City tries for public support of programs and costs for defenses while public relations results are unconscionably “encouraging rebuilding and development

185. Richard O. Jacobs & Steven M. Hogan, *Will Our Future Drown? Paying for the Costs of Sea-Level Rise*, 91 FLORIDA BAR J. 52(2017) (referencing CORAL GABLES CITY COMMISSION, LEGAL CONSIDERATIONS SURROUNDING ADAPTATIONS TO THE THREAT OF SEA LEVEL RISE (2016)).

186. See CORAL GABLES CITY COMMISSION, LEGAL CONSIDERATIONS SURROUNDING ADAPTATIONS TO THE THREAT OF SEA LEVEL RISE 18-24 (2016).

187. Sarah J. Adams-Schoen, *Sink or Swim: In Search of a Model for Coastal City Climate Resilience*, 40 COLUM. J. OF ENVTL. L. 433, 511 (2015).

188. See *id.* at 511-12.

189. See *id.* at 483-84.

in vulnerable areas.”¹⁹⁰ Such waterfront development policies of municipalities fail to “curtail or eliminate waterfront development in high-risk areas, encourage or require relocation away from the most vulnerable areas,” despite foreseeable risk.¹⁹¹

Southeast Florida must also grapple with over-selling the effectiveness of adaptation infrastructures, or naively accepting assumptions of low rates of SLR that deny the severity. An additional concern is to take proper account of SLR together with storm surge elevations. At some point, part of the population will need to relocate. The loss of adaptive resilience in federally funded projects is a clear policy mistake for a sector.

On the positive side, Southeast Florida is doing well in its local policies with respect to the timing and content. Other local level climate change adaptation initiatives depicted by Thomas M. Gremillion, writing in 2011, compare favorably to Southeast Florida’s timing and approach. For instance, King’s County, Washington State (the Seattle area) convened its regional coordination effort from a 2005 conference, leading to water reuse programs that protect river flows. King’s County created a flood buyout and flood zone home elevation program, incorporated climate projections into its comprehensive plan, and assessed flooding and sea level rise.¹⁹² Gremillion uses examples of local government adaptation responses to conclude that local climate adaptation initiatives will lead other cities to follow with vulnerability assessments and action plans, which in turn should spawn interest in a “national climate change adaptation fund” to get adaptation into expanded operation.¹⁹³ Over the past 10 years, Southeast Florida followed much the same sequence identified for the Seattle area adaptation.

CONCLUSION

President Trump’s Executive Order of August 15, 2017 furthered his trillion-dollar national rebuilding proposal for roads, bridges and other

190. *Id.* at 512.

191. *Id.*

192. Thomas M. Gremillion, *Setting the Foundation: Climate Change Adaptation at the Local Level*, 41 ENVTL. L. 1221, 1245 (2011).

193. *Id.* at 1251-53.

infrastructures. A provision in his Executive Order repealed the Executive Order of January 30, 2015 of President Obama. The Obama version had upgraded the definition of floodplain for use in federally funded projects, so that a higher vertical dimension and correspondingly more extensive horizontal floodplain would be covered. The irony is that the durability of federally funded rebuilt infrastructure projects, such as President Trump's proposal, would be greater using the version of the floodplain definition that he revoked. A part of the cycle of "flood, rebuild, repeat" could be curtailed at large cost savings to taxpayers if the 2015 version were resurrected. Instead, the 40-year-old criteria of a 100-year floodplain is once again the standard for Federal Flood Risk Management of a multitude of projects.

While this FFRMS reform has gone on-and-off, Southeast Florida is unfortunately obliged to try to withstand the coming inundation of SLR across a wide area. The region is well-positioned to use an array of measures, but its low terrain makes the floodplain extraordinarily vulnerable. Local governmental leadership has followed scientific inputs to maximize its response, and the achievements are exemplary. The State already had very advanced comprehensive planning system prior to the realization of the nascent crisis. But Florida now struggles under long-ago decisions that led to high-density occupancy of beachfronts, hundreds of miles of residentially-lined canals, development in the Florida Keys, and built-out communities of low elevation in interior areas using flood level assumptions dating prior to SLR predictions. With so much economic value, every resiliency device feasible should be applied. Great effects on nature are at stake as well, from the biologically diverse Florida Keys to the immense, for now, fresh water Everglades wetland.

With such a daunting prognosis, the Southeast Florida region may need all the help it can get to respond to adaptation. Even seemingly small steps should not be omitted. Bigger expectations should be had for help from the State and Federal governments. One measure that could be beneficial would be restoration of a definition of floodplain for use in federally funded projects. The revoked floodplain definition leaves an inadequate vertical flood elevation and an underestimate of the horizontal floodplain to apply to federally funded projects, instead of a resilience standard that favored the option of a Climate-Informed Science Approach (CISA). Trump's revocation could, in turn, be

undone either by administrative action through a new Executive Order, or perhaps more likely by Act of Congress, travelling as a proviso for the trillion-dollar re-building of infrastructure. This would further the building of strong, appropriate federal infrastructure and ultimately save tax money by ensuring that federally funded projects are resilient against sea level rise.

Regardless of the fate of the floodplain definition, Southeast Florida has followed climate science for its SLR standards, heeding experts to gather a remarkable multi-county Regional Climate Compact. The adaptation measures follow detailed, prioritized plans. Soon the coastal counties statewide will have updated comprehensive plan elements about SLR. Informed policies about adaptations like road elevation, drainage, and pumps in some cities are being implemented, and heightening of seawalls is addressed as a method as well. Florida is the state projected to have the largest out-migration from SLR, estimated at about 2.5 million persons. From storm surge and high winds, Miami is the top port city in the world in terms of exposed assets, and fourth on the list of exposed populations. State and Federal legal provisions are needed to address obstacles to sound SLR policies, given the peril of flood.