

9-12-2016

Living With Water in a Climate-Changed World: Will Federal Flood Policy Sink or Swim? (with Debbie M. Chizewer)

A. Dan Tarlock

IIT Chicago-Kent College of Law, dtarlock@kentlaw.iit.edu

Deborah M. Chizewer

Northwestern Pritzker School of Law

Follow this and additional works at: http://scholarship.kentlaw.iit.edu/fac_schol



Part of the [Law Commons](#)

Recommended Citation

A. D. Tarlock & Deborah M. Chizewer, *Living With Water in a Climate-Changed World: Will Federal Flood Policy Sink or Swim? (with Debbie M. Chizewer)*, 46 *Envtl. L. Rev.* 491 (2016).

Available at: http://scholarship.kentlaw.iit.edu/fac_schol/922

This Article is brought to you for free and open access by the Faculty Scholarship at Scholarly Commons @ IIT Chicago-Kent College of Law. It has been accepted for inclusion in All Faculty Scholarship by an authorized administrator of Scholarly Commons @ IIT Chicago-Kent College of Law. For more information, please contact dginsberg@kentlaw.iit.edu.

LIVING WITH WATER IN A CLIMATE-CHANGED WORLD:
WILL FEDERAL FLOOD POLICY SINK OR SWIM?

BY

A. DAN TARLOCK* & DEBORAH M. CHIZEWER**

Global climate change will increase inland and coastal flooding, and strain already stressed flood damage prevention and mitigation systems. In the face of Congressional unwillingness to deal with the increased flood risks, the Obama Administration has undertaken several initiatives to support local resilience in the face of climate change-induced floods and sea level rise. We place these initiatives in the context of existing flood control and insurance programs which encourage moral hazard behavior. We argue that the reforms are promising, but the Obama Administration's approach is severely limited because the existing patchwork of flood-related legislation remains unreformed. The current, competing missions could hinder the reforms' effectiveness. The federal government's lack of a comprehensive climate change response and its retreat from flood control spending pushes the problem to local governments that must cope with increased flood events. Local governments, however, face their own political, fiscal, and legal barriers to adapt to the increased risks of climate change-induced floods. In this constrained environment, the federal government should induce local governments to align their land-use policies with emerging federal policies.

Local governments should lead on flood management because they are on the front lines of flooding; they also can most readily control land-use to manage floodplain development, a key strategy for

* A. Dan Tarlock is Distinguished Professor of Law at the Chicago- Kent College of Law and was Honorary Professor Law, University of Dundee Centre for Water Law, Policy, and Science, 2002-2012. He holds an A.B. and LL.B. from Stanford University and has previously been a permanent member of the faculties of the University of Kentucky and Indiana University, Bloomington. He is a National Associate of the National Academies of Science, Engineering and Medicine and a lifetime member of the American Law Institute. In the fall of 2017, Professor Tarlock will be the Distinguished Natural Resources Visitor at the Lewis and Clark College of Law.

** Debbie M. Chizewer teaches at Northwestern Pritzker School of Law in the Environmental Advocacy Clinic, and teaches an environmental law class at Chicago-Kent College of Law. Debbie received her J.D. from Boston University School of Law and her B.A., cum laude, from Princeton University. Immediately after law school, Debbie clerked for the Honorable Joseph Faman, Jr, in the U.S. District Court for the District of Delaware.

reducing flood damage. We can no longer rely almost exclusively on structural solutions to coastal sea level rise, storm surges and inland floods. Science does not support this position. The federal and state governments must encourage integrated flood management by providing guidelines and increasing incentives. The proposed federal flood risk management standard, new commitments to regional climate data collection, and existing federal grant programs—such as hazard mitigation planning grants and community block development grants—can provide important direction to local governments. Takings jurisprudence has the potential to chill these efforts. Courts also need to incorporate the moral hazard concept into takings analysis to support beneficial land-use policies that suit a climate-changed world.

Ultimately, the United States should move toward the European Union’s risk-based flood management approach and adopt integrated floodplain and coastal management in a comprehensive federal statutory scheme. Federal involvement in flood management can prevent disparity between states and provide an integrated structure that works across states lines.

I.	INTRODUCTION.....	493
II.	CLIMATE RESILIENCE REFORM	496
	A. <i>Executive Action</i>	496
	B. <i>Federal Agency Implementation</i>	499
III.	EXISTING FEDERAL LAW RELATED TO FLOOD MANAGEMENT	500
	A. <i>The Army Corps of Engineers’ Flood Control Efforts</i>	502
	1. <i>Funding Woes</i>	503
	2. <i>Failing Hard Structures</i>	504
	B. <i>The National Flood Insurance Act</i>	505
	1. <i>Outdated and Inaccurate Maps</i>	505
	2. <i>Insufficient Land-Use Requirements</i>	509
	C. <i>Coastal Management Law and Flood Control</i>	511
	1. <i>Coastal Zone Management Act</i>	511
	2. <i>Coastal Barrier Resources Act</i>	512
	D. <i>Disaster and Housing Law and Flood Control</i>	514
	1. <i>Hazard Mitigation Planning</i>	514
	2. <i>Community Development Block Grants</i>	516
IV.	WILL CLIMATE RESILIENCE REFORMS IMPROVE FEDERAL FLOOD MANAGEMENT?.....	517
	A. <i>Limits of Climate Resilience Executive Actions</i>	517
	B. <i>Climate Resilience Reforms and Federal Law</i>	519
	1. <i>Positive Impacts on Federal Law/Policy</i>	520
	a. <i>Leadership</i>	520
	b. <i>Agency Action</i>	520
	c. <i>Legislative Baby Steps (and Falls)</i>	521

2016] *SINK OR SWIM* 493

	2. <i>Obstacles for Implementing Climate Reforms into Federal Flood Policy</i>	521
	a. <i>Fiscal Issues</i>	522
	b. <i>Lack of Coordination</i>	522
	c. <i>Weak Enforcement</i>	522
V.	WILL THE CLIMATE REFORMS IMPROVE LOCAL FLOOD MANAGEMENT?....	523
	A. <i>Local, Adaptive Planning</i>	523
	B. <i>Adaptation Tools and Obstacles</i>	526
	1. <i>Local Power to Limit Floodplain Development</i>	526
	2. <i>State Response to Local Limits on Floodplain Development</i>	526
	3. <i>The Supreme Court Takings Jurisprudence's Influence on Flood Plain Regulation</i>	528
	C. <i>Federal Climate Reforms Can Boost Local Government Resilience Efforts</i>	534
VI.	CONCLUSION	536

I. INTRODUCTION

In the face of rising sea levels and increasingly frequent extreme weather events,¹ the Obama Administration has started to promote climate change adaptation. Because Congress has failed to pass any climate change mitigation or adaptation legislation,² the Administration has created two task forces, issued several executive orders, and pushed federal agencies to develop adaptation plans.³

The President's actions reflect the reality that “[m]ore than 50 percent of Americans live in coastal counties, where key infrastructure and evacuation routes are increasingly vulnerable to impacts like higher sea levels, storm surges, and flooding.”⁴ Inland urban settlement areas near

¹ NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., REDUCING COASTAL RISKS ON THE EAST AND GULF COASTS, 16 (2014); U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-290, HIGH-RISK SERIES: AN UPDATE 67 (2015) [hereinafter GAO-15-290] (citing U.S. GLOB. CHANGE RESEARCH PROGRAM, CLIMATE CHANGE IMPACTS IN THE UNITED STATES: THE THIRD NATIONAL CLIMATE CHANGE ASSESSMENT (Jerry M. Melillo, Terese (T.C.) Richmond, & Gary W. Yohe eds., 2014)).

² See Carl Hulse & David M. Herszenhorn, *Democrats Call Off Climate Change Bill*, N.Y. TIMES, July 23, 2010, at A15. The American Clean Energy and Security Act of 2009, H.R. 2454, 111th Cong. (2009), sponsored by Representatives Henry A. Waxman (D-Cal.) and Edward J. Markey (D-Mass.), would have addressed both mitigation and adaptation, but President Obama had to choose between advancing healthcare reform or the climate legislation in 2009–10, and he chose the former. Ryan Lizza, *As the World Burns*, NEW YORKER, Oct. 11, 2010, <http://www.newyorker.com/magazine/2010/10/11/as-the-world-burns> (last visited July 16, 2016).

³ See *infra* Part II.A.

⁴ Press Release, Council on Env'tl. Quality, Fact Sheet: Taking Action to Protect Communities and Reduce the Cost of Future Flood Disasters, (Jan. 30, 2015), http://www.whitehouse.gov/administration/eop/ceq/Press_Releases/January_30_2015 (last visited July 16, 2016) (citing the National Climate Assessment finding

rivers and lakes also face increased flood risks caused by more frequent extreme rain events.⁵ People are drawn to live alongside or near water but tend to discount the risks inherent in this choice. This moral hazard behavior is no longer sustainable. Losses from worldwide flood events nearly doubled in the ten years from 2000 to 2009 compared with the prior decade.⁶

Will the Obama Administration's climate resilience reforms provide the appropriate fix to existing, inadequate federal flood management legislation? We consider the reforms in the context of existing federal flood-related programs and local land-use regulation of floodplains. The United States lacks comprehensive, federal flood management legislation, compared to the European Union, but rather relies on a hodgepodge of flood-related laws with differing missions and distinct lead federal agencies.⁷ Historically, these myriad programs did not employ integrated flood management techniques, but rather relied heavily on structural solutions. Local governments retained responsibility for coping with the remaining risks. In light of this history, we argue that these reforms will substantially improve the federal flood management program but represent only a first step toward risk-based flood damage reduction.

We also consider whether the Obama Administration's climate resilience reforms will encourage and support more consistent local government flood management. With little historical support or guidance

that "[M]ore than \$1 trillion of property and structures in the U.S. are at risk of inundation from sea level rise of two feet above current sea level – an elevation that could be reached as early as 2050.").

⁵ See U.S. GEOLOGICAL SURVEY, OVERVIEW OF THE ARKSTORM SCENARIO 2–15 (2011) (describing the flooding in California caused by the winter storms of 1861–62, and discussing the potential impact of such storms today), available at http://pubs.usgs.gov/of/2010/1312/of2010-1312_text.pdf.

The [Atmospheric River 1,000 (ArkStorm)] has several public policy implications: (1) An ArkStorm raises serious questions about the ability of existing federal, state, and local disaster planning to handle a disaster of this magnitude. (2) A core policy issue raised is whether to pay now to mitigate, or pay a lot more later for recovery. (3) Innovative financing solutions are likely to be needed to avoid fiscal crisis and adequately fund response and recovery costs from a similar, real, disaster. (4) Responders and government managers at all levels could be encouraged to conduct risk assessments, and devise the full spectrum of exercises, to exercise ability of their plans to address a similar event. (5) ARkStorm can be a reference point for application of Federal Emergency Management Agency (FEMA) and California Emergency Management Agency guidance connecting federal, state and local natural hazards mapping and mitigation planning under the National Flood Insurance Plan and Disaster Mitigation Act of 2000. (6) Common messages to educate the public about the risk of such an extreme disaster as the ARkStorm scenario could be developed and consistently communicated to facilitate policy formulation and transformation.

Id. at vi.

⁶ ZURICH INS. GRP. LTD, ENHANCING COMMUNITY FLOOD RESILIENCE: A WAY FORWARD 3 (2014), available at http://opim.wharton.upenn.edu/risk/library/zurichfloodresiliencealliance_ResilienceIssueBrief_2014.pdf.

⁷ NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., *supra* note 1, at 8, 31, 33, 46, 56 (discussing the broad measures to reduce the consequences of flooding with no clear corresponding mission).

from the federal government, local governments have managed flood control with varying degrees of effectiveness. Some have engaged in a futile race with nature while others have moved forward with innovative, integrated flood management plans. In the months since these executive directives were issued, federal agencies already have released studies advancing more integrated planning and incorporating likely climate impacts.⁸ The federal government has participated in public-private partnerships to fund innovative, flood protection projects, including nonstructural flood management approaches.⁹ These incentive programs have the potential to encourage more local flood preparation as well. As executive branch measures, however, the climate resilience reforms will work only when the federal agencies willingly implement the guidelines.¹⁰

The biggest problem with the Administration's approach is that it leaves in place the existing patchwork of flood-related legislation. The current, competing missions could hinder the reforms' effectiveness. Local governments face their own political, fiscal, and legal barriers to adapt to the increased risks of climate change-induced floods. The federal government must induce local governments to align their land-use policies with emerging federal policies because we can no longer rely almost exclusively on structural solutions to coastal sea level rise, storm surges, and inland floods. Science does not support that position.

Local governments should lead on flood management because they are on the front lines of flooding; they also can most readily control land-use to manage floodplain development, a key strategy for reducing flood damage.¹¹ The federal and state governments must encourage integrated flood management by providing guidelines and increasing incentives. The proposed federal flood risk management standard, new commitments to regional climate data collection, and existing federal grant programs—such as hazard mitigation planning grants, and community block development grants—can provide important direction to local governments.

⁸ *E.g.*, U.S. ARMY CORPS OF ENG'RS, NORTH ATLANTIC COAST COMPREHENSIVE STUDY: RESILIENT ADAPTATION TO INCREASING RISK, at i-xi (2015) [hereinafter NACCS], available at http://www.nad.usace.army.mil/Portals/40/docs/NACCS/NACCS_main_report.pdf; FED. EMERGENCY MGMT. AGENCY, 2011-OPPA-01, FEMA CLIMATE CHANGE ADAPTATION POLICY STATEMENT 2-3 (2012) [hereinafter FEMA CLIMATE CHANGE ADAPTATION POLICY STATEMENT], available at http://www.fema.gov/media-library-data/20130726-1919-25045-3330/508_climate_change_policy_statement.pdf; Revised Draft Guidance for Federal Departments and Agencies on Consideration of Greenhouse Gas Emissions and the Effects of Climate Change in NEPA Reviews, 79 Fed. Reg. 77,802, 77,823-31 (Dec. 24, 2014).

⁹ In the wake of Hurricane Sandy, six innovative, local flood management projects for the New York-New Jersey area recently received funding through the Rebuild by Design competition. Rebuild by Design, *Finalists*, <http://www.rebuildbydesign.org/winners-and-finalists/> (last visited July 16, 2016).

¹⁰ Victor B. Flatt, *Focus and Fund: Executing Our Way to a Federal Climate Change Adaptation Plan*, 32 VA. ENVTL. L.J. 157, 166-67 (2014).

¹¹ This is a world wide problem for cities. See S.H.A. Koop & C.J. van Leeuwen, *The Challenges of Water, Waste and Climate Change in Cities*, ENV'T, DEV. & SUSTAINABILITY, Feb. 1, 2016 *passim*.

Ultimately, the United States should move toward the European Union's risk-based flood management approach¹² and adopt integrated floodplain and coastal management in a comprehensive federal statutory scheme. Floodplains and coastal areas must be managed through a combination of structural defenses, upstream storage, design modifications, and land-use controls including both retreat from vulnerable areas and integrated floodplain management. The formulation and adoption of an integrated policy will be extremely difficult, but it will avoid rising damage costs, increased public risks and social disruption, and will promote water security.¹³

Part II of this Article details the Obama Administration's climate resilience reform measures. Part III considers the effectiveness of existing flood-related federal laws. Part IV analyzes the climate resilience reforms' ability to improve existing federal programs. Part V explores local government flood management, the available adaptation tools, and the obstacles posed by the Supreme Court's takings jurisprudence.

II. CLIMATE RESILIENCE REFORM

A. Executive Action

In the face of legislative resistance, indifference, and gridlock, President Obama has acted unilaterally to promote climate resilience planning. He has issued several executive orders to date.¹⁴ The first,

¹² Council Directive 2007/60, 2007 O.J. (L 288) 27 (EC). See Debbie M. Chizewer & A. Dan Tarlock, *New Challenges for Urban Areas Facing Flood Risks*, 40 *FORDHAM URB. L.J.* 1739, 1766–91 (2013) (discussing in detail the European Union Flood Directive and using it as a tool to evaluate examples of U.S. local governments' flood management efforts).

¹³ The international water community has adopted the constructs of water stress and security as a measure of a country's water well-being or its ability to mitigate flood risks. For a more extended discussion of these constructs, see A. Dan Tarlock, *Toward a More Robust International Water Law of Cooperation to Address Droughts and Ecosystem Conservation*, 28 *GEO. ENVTL. L. REV.* 261, 263–265 (2016). Water stress has two meanings. The first refers to countries with poor hydrology, inadequate or excess rain. The second meaning of water stress is the lack of institutional capacity, such as storage, strong allocation systems, and effective management, to manage risks such as flooding. Water security has three dimensions: economic, social, and environmental. The first focuses on increasing water productivity and decreasing flood damage; the second on assuring equitable access; and the third focuses on sustainable management of aquatic ecosystem and the restoration of aquatic ecosystem services, including the widening of floodplains. EELCO VAN BECK & WOUTER LINCKLAEN ARRIENS, *WATER SECURITY: PUTTING THE CONCEPT INTO PRACTICE* 12–13 (2014) available at http://www.gwp.org/Global/ToolBox/Publications/Background%20papers/GWP_TEC20_web.pdf.

¹⁴ See Federal Leadership in Environmental, Energy, and Economic Performance, Exec. Order No. 13,514, 3 C.F.R. 248 (2010); Establishing the Hurricane Sandy Rebuilding Task Force, Exec. Order No. 13,632, 3 C.F.R. 328 (2013); Preparing the United States for the Impacts of Climate Change, Exec. Order No. 13,653, 3 C.F.R. 330 (2014); Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, Exec. Order No. 13,690, 80 Fed. Reg. 6,425 (Feb. 4, 2015), and Planning for Federal Sustainability in the Next Decade, Exec. Order No. 13,693, 80 Fed. Reg. 15,871 (Mar. 25, 2015).

Executive Order 13,514, issued on October 5, 2009, directed agencies to participate actively in the Interagency Climate Change Adaptation Task Force.¹⁵ In 2010, the Council on Environmental Quality (CEQ) issued a task force progress report that called for adaptation based on science, integrated and risk-based approaches.¹⁶ CEQ subsequently issued instructions and a deadline for federal agencies to develop a climate adaptation plan.¹⁷

After Congress failed to pass climate change legislation in 2010, President Obama began in earnest to assert his executive powers to promote climate change mitigation and adaptation. The enormous impact of Hurricane Sandy in 2012 further motivated climate resilience reform. Executive Order 13,632 created the Hurricane Sandy Rebuilding Task Force and has enabled federal, state, and local actors to proceed with the recovery with an eye toward future climate change impacts.¹⁸ The Hurricane Sandy Task Force made several recommendations: 1) Facilitate the incorporation of future risk assessment, such as sea level rise, into rebuilding efforts with the development of a sea level rise tool; 2) develop a minimum flood risk reduction standard for major Federal investment that takes into account data on current and future flood risk; and 3) create a design competition to develop innovative resilient design solutions that address the Sandy-affected region's most pressing vulnerabilities.¹⁹

The task force's work led to the development of shared federal resilience guidelines to govern Sandy-related infrastructure investment.²⁰ The Task Force specifically recommended more integrated and regional planning that will "promote better decision making, create more efficient and effective projects, and . . . avoid unintended impacts."²¹ State and local stakeholders will be able to design more effective projects based on knowledge of other related investments, and the integrated and regional

¹⁵ Exec. Order No. 13,514, § 16, 3 C.F.R. 248, 258 (2010). This Executive Order was revoked by President Obama's fifth executive order on this subject. Exec. Order No. 13,693, § 16(b), 80 Fed. Reg. 15,871, 15,880. Because Executive Order 13,693 focuses on greenhouse gas emissions and energy efficiency, and does not address directly the issues around flooding and climate change adaptation, we do not discuss it in this Article.

¹⁶ COUNCIL ON ENVTL. QUALITY, PROGRESS REPORT OF THE INTERAGENCY CLIMATE CHANGE ADAPTATION TASK FORCE: RECOMMENDED ACTIONS IN SUPPORT OF A NATIONAL CLIMATE CHANGE ADAPTATION STRATEGY 9–10 (2010), *available at* <https://www.whitehouse.gov/sites/default/files/microsites/ceq/Interagency-Climate-Change-Adaptation-Progress-Report.pdf>.

¹⁷ COUNCIL ON ENVTL. QUALITY, INSTRUCTIONS FOR IMPLEMENTING CLIMATE CHANGE ADAPTATION PLANNING IN ACCORDANCE WITH EXECUTIVE ORDER 13514 (2011), *available at* http://www.whitehouse.gov/sites/default/files/microsites/ceq/adaptation_final_implementing_instructions_3_3.pdf.

¹⁸ Exec. Order No. 13,632, 3 C.F.R. 328 (2013). The Executive Order charged the task force with identifying and removing "obstacles to resilient rebuilding in a manner that addresses existing and future risks and vulnerabilities and promotes the long-term sustainability of communities and ecosystems." *Id.* § 3(c), at 329.

¹⁹ HURRICANE SANDY REBUILDING TASK FORCE, HURRICANE SANDY REBUILDING STRATEGY: STRONGER COMMUNITIES, A RESILIENT REGION 43–47 (2013).

²⁰ *Id.* at 49–83.

²¹ *Id.* at 54.

planning will reduce the “risk of unplanned redundancies or gaps in resilience.”²²

In response to the Task Force’s findings, President Obama’s next executive action, the Climate Action Plan (Plan), promotes climate change mitigation and adaptation.²³ Executive Order 13,653 supplemented the Plan and required federal agencies to consider removing barriers to investment in climate change resilience as well as reforming policies that increase vulnerability to climate change related risks.²⁴ Federal agencies also must identify opportunities to support state and local investment in resilience.²⁵ The 2014 Climate Data Initiative supports the Climate Action Plan by improving the reliability of information as well as access to information that can help private and public entities plan for resilience.²⁶ The Climate Data Initiative also encourages entrepreneurs to develop more useful and accurate modeling.²⁷

On January 30, 2015, President Obama issued another flood-related Executive Order, 13,690, “Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input.”²⁸ The Executive Order seeks “to improve the resilience of communities and Federal assets against the impacts of flooding . . . anticipated to increase over time due to the effects of climate change and other threats.”²⁹ Executive Order 13,690 builds on and modifies President Carter’s 1977 Executive Order 11,988 by requiring federal agencies “to avoid direct or indirect support of floodplain development wherever there is a practicable alternative.”³⁰

Agencies must undertake a multipronged analysis prior to siting federal buildings in the floodplain.³¹ The new draft, flexible Federal Flood Risk Management standard provides a flexible approach for federal agencies to manage siting, design, and construction in the floodplain. Agencies may:

²² *Id.*

²³ EXEC. OFFICE OF THE PRESIDENT, THE PRESIDENT’S CLIMATE ACTION PLAN 5 (2013), available at <http://www.whitehouse.gov/sites/default/files/image/president27sclimateactionplan.pdf>.

²⁴ Preparing the United States for the Impacts of Climate Change, Exec. Order No. 13,653, § 2, 3 C.F.R. 330, 331 (2014).

²⁵ Press Release, Exec. Office of the President, Fact Sheet: The President’s Climate Data Initiative (Mar. 19, 2014), <https://www.whitehouse.gov/the-press-office/2014/03/19/fact-sheet-president-s-climate-data-initiative-empowering-america-s-comm> (last visited July 16, 2016).

²⁶ *Id.*

²⁷ *Id.*

²⁸ Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, Exec. Order No. 13,690, 80 Fed. Reg. 6,425 (Feb. 4, 2015).

²⁹ *Id.* at 6,425.

³⁰ *Id.* (modifying Floodplain Management, Exec. Order No. 11,988, 3 C.F.R. 117 (1978)).

³¹ FED. EMERGENCY MGMT. AGENCY, DRAFT REVISED GUIDELINES FOR IMPLEMENTING EXECUTIVE ORDER 11,988, FLOODPLAIN MANAGEMENT 27–30 (2015), available at <http://www.fema.gov/media-library-data/1422653213069-9af488f43e1cf4a0a76ae870b2dcede9/DRAFT-FFRMS-Implementating-Guidelines-1-29-2015r2.pdf>.

- (1) Use data and methods informed by best available, actionable climate science;
- (2) Build two feet above the 100-year (1%-annual-chance) flood elevation for standard projects, and three feet above for critical buildings like hospitals and evacuation centers; or
- (3) Build to the 500-year (0.2%-annual-chance) flood elevation.³²

Executive Order 13,690 also requires federal agencies to use, when possible, “natural systems, ecosystem processes, and nature-based approaches” in developing alternatives to development in the floodplain.³³ The Executive Order is not intended to impact the National Flood Insurance Program (NFIP), and does not require the modification of local floodplain ordinances adopted in conjunction with the NFIP.³⁴

The effectiveness of these climate reforms depends in large part on how the subject federal agencies respond to the call for changes. The next section discusses current agency action to implement the climate reforms.

B. Federal Agency Implementation

Based on these executive orders, federal agencies have started to evaluate policies relating to flood management and climate resilience. The CEQ has developed a guidance document for agencies as they prepare adaptation plans.³⁵ Many agencies have crafted policies for integrating climate change adaptation into their operations.³⁶ The United States Army Corps of Engineers (the Corps) has issued several reports addressing climate adaptation since 2013.³⁷ The Corps’ North Atlantic Coast Comprehensive Study (NACCS) responded to the post-Sandy Disaster Relief Appropriations Act of 2013,³⁸ which directed the Corps to “conduct . . . a

³² Council on Env'tl. Quality, *supra* note 4.

³³ 80 Fed. Reg. at 6,426.

³⁴ See Chad Berginnis, Exec. Dir., Ass'n of State Floodplain Managers, Member and Partner Briefing on EO 13690 & The Federal Flood Risk Management Standard 16 (Feb. 10, 2015) (slides available at http://www.floods.org/ace-files/documentlibrary/FloodRiskMngmtStandard/FFRMS_Basics_Mbr_Briefing_2.10.2015_SLIDES.pdf). The final implementation guidelines were issued in October 2015. 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, 80 Fed. Reg. 64,008 (Oct. 22, 2015).

³⁵ COUNCIL ON ENVTL. QUALITY, *supra* note 17.

³⁶ *E.g.*, FEMA CLIMATE CHANGE ADAPTATION POLICY STATEMENT, *supra* note 8; U.S. ARMY CORPS OF ENG'RS, CLIMATE CHANGE ADAPTATION PLAN (2014), *available at* http://www.usace.army.mil/Portals/2/docs/Sustainability/Performance_Plans/2014_USACE_Climate_Change_Adaptation_Plan.pdf; U.S. ENVTL. PROT. AGENCY, EPA 100-K-14-001, CLIMATE CHANGE ADAPTATION PLAN (2014), *available at* <http://www.epa.gov/climatechange/Downloads/EPA-climate-change-adaptation-plan.pdf>.

³⁷ See U.S. ARMY CORPS OF ENG'RS, COASTAL RISK REDUCTION AND RESILIENCE (2013), *available at* <http://www.swg.usace.army.mil/Portals/26/docs/PAO/Coastal.pdf>; U.S. ARMY CORPS OF ENG'RS, *SUPRA* note 36; NACCS, *supra* note 8.

³⁸ Disaster Relief Appropriations Act of 2013, Pub. L. No. 113-2, 127 Stat. 4.

comprehensive study to address the flood risks of vulnerable coastal populations in areas that were affected by Hurricane Sandy.³⁹ The NACCS report provides a risk management framework and supports coastal communities in efforts to consider future sea level and climate change scenarios.⁴⁰ The Corps assesses vulnerability, or the inability to cope with adverse effects of coastal flooding, by analyzing the nature and magnitude of the hazard and the characteristics of the community.⁴¹

The Federal Emergency Management Agency (FEMA), our disaster first responder, has encouraged local governments to integrate hazard mitigation⁴² analysis into land-use decisions.⁴³ FEMA justified its expanded role in influencing local government action relating to disaster damages because: 1) hazard mitigation planning fits squarely in the local government's role in protecting the welfare of the community, and 2) the economic benefits of proactively avoiding or minimizing risk through safe development practices outweigh the costs of damage and disruption.⁴⁴

The United States Environmental Protection Agency (EPA) also has been out front in its work with communities to improve the integration of hazard assessment into local planning. EPA has issued additional guidance and supported local efforts to engage in resilience planning that considers climate change.⁴⁵ For instance, it has developed a resilience checklist for communities.⁴⁶

As the examples illustrate, agencies are moving forward in climate reforms within their purview. The reach of these agency-level changes will depend in part on how the changes fit into existing federal law related to flood management.

III. EXISTING FEDERAL LAW RELATED TO FLOOD MANAGEMENT

Without the support of the resistant Congress, the Obama Administration's recent flood management reforms did not replace existing federal flood related laws, and thus, the interplay between the reforms and

³⁹ *Id.* at 5.

⁴⁰ NACCS, *SUPRA* note 8, at i.

⁴¹ *Id.* at 21.

⁴² The term "hazard mitigation" means "sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards." 44 C.F.R. § 201.2 (2015).

⁴³ FED. EMERGENCY MGMT. AGENCY, INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING: CASE STUDIES AND TOOLS FOR COMMUNITY OFFICIALS 1-1 (2013) [hereinafter FEMA INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING], *available at* http://www.fema.gov/media-library-data/20130726-1908-25045-0016/integrating_hazmit.pdf.

⁴⁴ *Id.* at 2-1.

⁴⁵ *E.g.*, U.S. ENVTL. PROT. AGENCY, LOCAL CLIMATE AND ENERGY PROGRAM MODEL DESIGN GUIDE: ENHANCING VALUE AND CREATING LASTING PROGRAMS (2015), *available at* <https://www.epa.gov/sites/production/files/2015-08/documents/csc-ep-program-design-guide-13-april-2015-508-v2.pdf>.

⁴⁶ U.S. ENVTL. PROT. AGENCY, EPA 231-R-14-003, PLANNING FOR FLOOD RECOVERY AND LONG-TERM RESILIENCE IN VERMONT: SMART GROWTH APPROACHES FOR DISASTER-RESILIENT COMMUNITIES app. C (2014), *available at* <http://www.epa.gov/sites/production/files/2014-07/documents/vermont-sgia-final-report.pdf>.

existing law may determine the reforms' success. Flood management is contained in several federal statutes and responsibility is distributed among a wide range of federal agencies. The lack of a unified and comprehensive legislation reflects a tension between local and federal control over resource management, and a longstanding unwillingness to accept the true risks involved in living near the water.

The Corps had served as the lead flood control agency for decades, but its power declined beginning in the 1970s.⁴⁷ The end of the "Big Dam Era"⁴⁸ and piecemeal funding moved the Corps' work away from comprehensive planning and toward smaller, local flood control projects.⁴⁹ Several other agencies—including FEMA and the National Oceanic and Atmospheric Administration (NOAA)—play a substantial role in coastal flood management.⁵⁰

Three core federal statutes—the Coastal Zone Management Act (CZMA),⁵¹ the Coastal Barrier Resources Act (CBRA),⁵² and the National Flood Insurance Act⁵³—along with the Corps' flood control projects envision a three-pronged approach to flood protection. First, federal maps of vulnerable areas serve as the baseline for flood, hurricane and storm preparation.⁵⁴ Second, federal subsidies, grants, and other funding soften federal obligations, and induce states and local governments to implement the programs.⁵⁵ Third, federally subsidized flood insurance would ultimately transition to actuarial insurance.⁵⁶ Sadly, these laws have largely failed to promote protective land-use decisions in vulnerable coastal areas.

⁴⁷ NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., CORPS OF ENGINEERS WATER RESOURCES INFRASTRUCTURE: DETERIORATION, INVESTMENT, OR DIVESTMENT? 24–25 (2012).

⁴⁸ See generally JOHN R. FERRELL, U.S. ARMY CORPS OF ENG'RS, THE BIG DAM ERA: A LEGISLATIVE AND INSTITUTIONAL HISTORY OF THE PICK-SLOAN MISSOURI BASIN PROGRAM (1993) (discussing the Corps' role in the construction and management of several large dams during the 20th century).

⁴⁹ ASSOCIATED PROGRAMME ON FLOOD MANAGEMENT, WORLD METEOROLOGICAL ORG. & GLOB. WATER P'SHIP, INTEGRATED FLOOD MANAGEMENT CASE STUDY USA: FLOOD MANAGEMENT - MISSISSIPPI RIVER 6–8 (2004), available at http://www.apfm.info/publications/casestudies/cs_usa_mississippi_full.pdf.

⁵⁰ See Fed. Emergency Mgmt. Agency, *Coastal Flood Risks: Achieving Resilience Together*, <https://www.fema.gov/coastal-flood-risks-achieving-resilience-together> (last visited July 16, 2016) (FEMA's homepage for all resources and mapping related to its coastal flood management program); Nat'l Oceanic & Atmospheric Admin., *Digital Coast: Office of Coastal Management*, <https://coast.noaa.gov/digitalcoast/> (last visited July 16, 2016) (NOAA's homepage for its coastal management program).

⁵¹ Coastal Zone Management Act of 1972, 16 U.S.C. §§ 1451–1466 (2012).

⁵² *Id.* §§ 3501–3510.

⁵³ National Flood Insurance Act of 1968, 42 U.S.C. §§ 4001–4130 (2012).

⁵⁴ FED. EMERGENCY MGMT. AGENCY & NAT'L OCEANIC & ATMOSPHERIC ADMIN., PREPARING FOR HURRICANES AND COASTAL FLOODING: A HANDBOOK FOR LOCAL OFFICIALS 4 (1983), available at <https://www.gpo.gov/fdsys/pkg/CZIC-tc223-p74-1983/pdf/CZIC-tc223-p74-1983.pdf>.

⁵⁵ *Id.* at 105, 107–110.

⁵⁶ FLOOD INS. SUBCOMM., AM. ACAD. OF ACTUARIES, THE NATIONAL FLOOD INSURANCE PROGRAM: PAST, PRESENT . . . AND FUTURE? 1–3 (2011), available at https://www.actuary.org/files/publications/AcademyFloodInsurance_Monograph_110715.pdf.

Federal disaster and housing laws also impact flood management, because they provide another source of funding for flood-related improvements.⁵⁷ These programs provide important incentives and guidelines for state and local governments, but the funding becomes available only after disasters.⁵⁸ While the current federal flood regime influences state and local decision making, a closer look reveals that the federal programs do not do enough to support strong, risk-based local land-use rules.⁵⁹

A. *The Army Corps of Engineers' Flood Control Efforts*

The Corps has not achieved integrated and effective flood management because the current funding structure has discouraged basin wide planning, reinforced the Corps' longstanding reliance on hard structures, and allowed levees to fall into disrepair.⁶⁰

The Flood Control Act of 1917⁶¹ cemented the Corps' mission of flood management. The federal government began constructing levees, but it still turned them over to local interests for maintenance.⁶² In the late 1920s, in response to severe flooding on the Mississippi River, the federal government

⁵⁷ Jennifer Wriggins, *Flood Money: The Challenge of U.S. Flood Insurance Reform in a Warming World*, 119 PENN. ST. L. REV. 361, 373, 382 (2014).

⁵⁸ CAROLYN KOUSKY & LEONARD SHABMAN, RESOURCES FOR THE FUTURE, THE REALITIES OF FEDERAL DISASTER AID 5 (2012), available at <http://www.rff.org/files/sharepoint/WorkImages/Download/RFF-IB-12-02.pdf>.

⁵⁹ See generally A. Dan Tarlock, *Land Use Regulation: The Weak Link in Environmental Protection*, 82 WASH. L. REV. 651, 654–55 (2007) (“During the formative period of environmental law in the now mythic 1960s, the expectation was that land would be subjected to comprehensive environmental regulation along with air and water. . . . From 1961–1969, the Department of Interior was run by one our greatest secretaries of Interior, Stewart Udall. . . . Secretary Udall’s 1964 book, *The Quiet Crisis*. . . set out to revive and adapt the public land-focused conservation tradition to the new emerging, more comprehensive environmental consciousness.”). U.S. Senator Henry Jackson (R-Wash.) tried to legislate Secretary Udall’s vision. *Id.* at 656. In 1972, the Senate Committee on Interior and Insular Affairs issued a report, which criticized the delegation of state planning and regulatory to local governments. *Id.* In 1973, the Committee reported out the National Land Use Policy and Planning Assistance Act, S. 268, 93rd Cong. (1973). The bill fell to intense local and state opposition. *Id.* After its narrow defeat, all efforts for general federal land-use planning disappeared from the political scene never to reappear. *Id.*

⁶⁰ John Flesher & Cain Burdeau, *First Federal Flood-control Inspection Finds Flawed Levees Across U.S.*, DALL. MORNING NEWS, Jan. 17, 2013, <http://www.dallasnews.com/news/local-news/20130117-first-federal-flood-control-inspection-finds-flawed-levees-across-u.s.ece> (last visited July 16, 2016) (Noting that inspectors took “the first-ever inventory of flood control systems overseen by the federal government have found hundreds of structures at risk of failing and endangering people and property in 37 states.”). No unified levee system exists and 85% are locally owned. AM. SOC’Y OF CIVIL ENG’RS, 2013 REPORT CARD FOR AMERICA’S INFRASTRUCTURE 23–25 (2013), available at <http://www.infrastructurereportcard.org/a/documents/2013-Report-Card.pdf> (grading the levee system as a “D-”).

⁶¹ Pub. L. No. 64-367, 39 Stat. 948.

⁶² CHRISTINE A. KLEIN & SANDRA B. ZELLMER, MISSISSIPPI RIVER TRAGEDIES: A CENTURY OF UNNATURAL DISASTER 42–61 (2014) (tracing the Corps’ transition from disclaiming any responsibility for flood management to the 1917 which authorized federal levee construction).

took on increased responsibility for flood control; it also forced the Corps to move beyond its focus on levees toward river basin management through multipurpose water projects.⁶³ Although the Corps began to shift away from its historic emphasis on levees, federal funding issues and failing hard structures have plagued its efforts at flood control.

1. Funding Woes

The entire notion of comprehensive river basin development died in the 1970s. At the dawn of the environmental movement, Congress created a National Water Commission, the last serious attempt to craft a rational federal water resources policy.⁶⁴ The Commission's 1973 Report critiqued the lack of focus and coordination in federal water resources planning, which it essentially characterized as planning for planning's sake.⁶⁵

Shortly after the 1973 Report, the funding mechanism for the Corps changed, which ultimately altered the nature of the Corps' work. Periodic, omnibus Corps authorization bills rather than basin-wide project authorizations—called Water Resource Development Acts (WRDAs)—became the funding mechanisms for the Corps.⁶⁶ The Corps, accordingly, shifted away from major dam projects to small, local flood control projects.⁶⁷ The Corps has always required Congressional funding on a project-by-project or program basis⁶⁸ because it has no independent authority to propose and build projects.⁶⁹ From 1986–2000, Congress passed a WRDA roughly every two years, but two seven-year gaps have occurred since 2000.⁷⁰

⁶³ See *id.* at 76–78 (explaining congressional authorization of reservoirs, spillways, and other structural flood control devices); see also Christine A. Klein & Sandra B. Zellmer, *Mississippi River Stories: Lessons from a Century of Unnatural Disasters*, 60 SMU L. REV. 1471, 1486 (2007) (same).

⁶⁴ See BETSY A. CODY & NICOLE T. CARTER, CONG. RESEARCH SERV., R40573, 35 YEARS OF WATER POLICY: THE 1973 NATIONAL WATER COMMISSION AND PRESENT CHALLENGES 1–5 (2009) (discussing the 1968–73 National Water Commission).

⁶⁵ *Id.* at 8 (“The Commission found that budgeting procedures neither reflected nor promoted regional or long-term water resources development.”).

⁶⁶ A. Dan Tarlock, *United States Flood Control Policy: The Incomplete Transition from the Illusion of Total Protection to Risk Management Disaster Law*, 23 DUKE ENVTL. L. & POL'Y F. 151, 175 (2012).

⁶⁷ *Id.* More recently, these authorization statutes have been re-named “Water Resources Reform and Development Acts.” *E.g.*, Water Resources Reform and Development Act of 2014, Pub. L. No. 113-121, 128 Stat. 1193.

⁶⁸ “Generally, about 85% of the appropriations for Corps civil works activities are directed to specific projects.” CARL E. BEHRENS, CONG. RESEARCH SERV., R42498, ENERGY AND WATER DEVELOPMENT: FY2013 APPROPRIATIONS 5 (2013).

⁶⁹ NICOLE T. CARTER & CHARLES V. STERN, CONG. RESEARCH SERV., R41243, ARMY CORPS OF ENGINEERS: WATER RESOURCE AUTHORIZATIONS, APPROPRIATIONS, AND ACTIVITIES 1 (2016). The 1986 WRDA cemented this disjointed approach and accepted the post-New Deal argument that small projects were only of local importance; local sponsors would share the costs, under a variety of cost-sharing formulas for new projects. NICOLE T. CARTER & BETSY A. CODY, CONG. RESEARCH SERV., RS20866, THE CIVIL WORKS PROGRAM OF THE ARMY CORPS OF ENGINEERS: A PRIMER 4–5 (2005).

⁷⁰ CARTER & STERN, *supra* note 69, at 1.

Reliance on WRDAs has inhibited basin wide scale and regional flood control planning; as the Congressional Research Service has observed, “the appropriated funds for an individual study or project . . . [may be] insufficient to permit the optimum programming of work by the Corps.”⁷¹

The most recent WRDA, the Water Resources Reform and Development Act of 2014,⁷² offers some positive features, but it also perpetuates piecemeal and ineffective flood management planning. On the plus side, it 1) authorized \$50 million for the dissemination of flood information, 2) strengthened the levee inspection program,⁷³ and 3) required a National Academy of Sciences study on ways to reduce risk to human life from extreme weather events in coastal areas including new infrastructure and coastal restoration options.⁷⁴

On the minus side, it relaxed the NEPA process for new projects, again discouraging regional flood control planning.⁷⁵

2. *Failing Hard Structures*

Although the Corps had incorporated some upstream resource management tools in the middle of the 20th century, its overall approach has relied heavily on hard structures, such as dams and levees, for floodwater retention.⁷⁶ Dams and levees have prevented millions of dollars of flood damages, but the illusion of safety created by the hard structures often led to risky development behind the structures.⁷⁷ Dams and levees may actually increase flood damage when a serious flood occurs and the structures cannot contain it.⁷⁸ Today, many of the nation’s levees are not constructed to deal with the 100-year flood, let alone the increased frequency and magnitude of floods associated with climate change.⁷⁹ In 2010, the National Association of State Flood Plain Managers warned that, due to deteriorating levees, climate change, and federal budget priorities, “[w]e will soon enter an era of levee ‘triage’ – the process of prioritizing federal response to flood

⁷¹ NICOLE T. CARTER & H. STEVEN HUGHES, CONG. RESEARCH SERV., RL32064, ARMY CORPS OF ENGINEERS WATER RESOURCES ACTIVITIES: AUTHORIZATION AND APPROPRIATIONS 7 (2005).

⁷² Pub. L. No. 113-121, 128 Stat. 1193 (2014).

⁷³ Unfortunately, the levee inspection program has been slow to take off, mostly due to resource limitations. U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-16-709, LEVEE SAFETY: ARMY CORPS AND FEMA HAVE MADE LITTLE PROGRESS IN CARRYING OUT REQUIRED ACTIVITIES 1 (2016) “[T]he Corps has been working to develop a national levee inventory, but the agencies have taken no action on the remaining key national levee-safety-related activities for which they are responsible under the act.” *Id.*

⁷⁴ § 1030(h), 128 Stat. at 1232; § 3016, 128 Stat. at 1289; § 3023, 128 Stat. at 1302.

⁷⁵ NICOLE T. CARTER ET AL., CONG. RESEARCH SERV., R43298, WATER RESOURCES REFORM AND DEVELOPMENT ACT OF 2014: COMPARISON OF SELECT PROVISIONS 7 (2014).

⁷⁶ Chizewer & Tarlock, *supra* note 12, at 1749–50. Because the Corps historically focused on civil and military building, it often leaned heavily on this hard structure approach. *See* ORRIN H. PILKEY AND KATHARINE L. DIXON, THE CORPS AND THE SHORE 221–23 (1996).

⁷⁷ Tarlock, *supra* note 66, at 166.

⁷⁸ *Id.*

⁷⁹ ASS’N OF STATE FLOODPLAIN MANAGERS, NATIONAL FLOOD RISK MANAGEMENT – LEVEE SAFETY COMPONENT 1 (2010).

risk associated with levees and rationing scarce federal dollars on multiple-objective risk reduction projects.”⁸⁰

B. The National Flood Insurance Act

The National Flood Insurance Act of 1968 was a bold, far sighted effort to guide development away from flood-prone areas and reducing taxpayer expenses associated with flood losses,⁸¹ but it has not achieved these goals. The National Flood Insurance Program (NFIP) provides flood insurance to residents in high risk flood areas in exchange for local government land-use plans discouraging future development in these areas.⁸² Six catastrophic years, in which FEMA paid \$1 billion or more, have severely impaired the financial stability of the program.⁸³ Insufficient land-use requirements, outdated and inaccurate mapping, and reliance on an increasingly discredited 100-year flood model to set rates have contributed significantly to its ineffectiveness.⁸⁴

1. Outdated and Inaccurate Maps

Effective floodplain management and insurance rates depend on state of the art, accurate maps. Unfortunately, FEMA has neither created accurate

⁸⁰ *Id.* No unified levee system exists and 85% are locally owned. AM. SOC’Y OF CIVIL ENG’RS, *supra*note 60, at 23.

⁸¹ Section 1302 of the National Flood Insurance Act of 1968 lays out important land-use goals for states and local governments: 1) Encourage state and local “land use adjustments to constrict the development of land” in flood-prone areas; 2) Guide development away from flood-prone areas; and 3) Encourage lending institutions to support the flood insurance objectives. Pub. L. No. 90-448, § 1302(e), 82 Stat. 476, 573. In the spirit of discouraging development in the coastal flood zone, President Jimmy Carter issued Executive Order 11988 “to require federal agencies to avoid direct and indirect support of floodplain development in coastal velocity zones—the so-called V zones on Flood Insurance Rate Maps (FIRMS)—by taking action “to reduce the risk of flood loss, to minimize the impact of floods on human safety, health and welfare, and to restore and preserve the natural and beneficial values served by floodplains in carrying out its responsibilities.” RAWLE O. KING, CONG. RESEARCH SERV., R42850, THE NATIONAL FLOOD INSURANCE PROGRAM: STATUS AND REMAINING ISSUES FOR CONGRESS 25 (2013) (quoting Floodplain Management, Exec. Order No. 11,988, §1, 3 C.F.R. 117, 117 (1978)).

⁸² § 1302, 82 Stat. at 572–73.

⁸³ KING, *supra* note 80, at 16–17. In addition, between 1978 and 2011, NFIP experienced nine loss years—i.e., loss payments exceeded premiums. *Id.* at 17.

⁸⁴ The failings of the NFIP have been analyzed extensively. *See infra* notes 92–94; *see, e.g.*, U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-14-297R, OVERVIEW OF GAO’S PAST WORK ON THE NATIONAL FLOOD INSURANCE PROGRAM (2014) [hereinafter GAO-14-297R]; Erwann O. Michel-Kerjan, *Catastrophe Economics: The National Flood Insurance Program*, J. ECON. PERSP., Fall, 2010, at 165, 166 (pointing out the disconnect between actual risk and the current NFIP insurance premium structure); Oliver A. Houck, *Rising Water: The National Flood Insurance Program and Louisiana*, 60 TUL. L. REV. 61, 159–64 (1985) (analyzing the NFIP and making suggestions to improve its economic and political viability). Congress recognized that truly exceptional events would trigger the need for the program to borrow money from the federal government. NAT’L RESEARCH COUNCIL OF THE NAT’L ACADS., TYING FLOOD INSURANCE TO FLOOD RISK FOR LOW-LYING STRUCTURES IN THE FLOODPLAIN 10 (2015) [hereinafter TYING FLOOD INSURANCE TO FLOOD RISK].

maps nor updated maps in a timely way.⁸⁵ FEMA's Flood Insurance Rate Maps (FIRMs or flood maps) determine whether property owners are in or out of a Special Flood Hazard Area (SFHA)—the “100-year flood” or 1% flood area⁸⁶—and whether they require flood insurance.⁸⁷ Flood maps factor in topographic surveys and information regarding river flow, storm tides, rainfall, and hydrologic/hydraulic analyses, and illustrate the floodplain boundaries.⁸⁸ The communities that want to participate in the NFIP must *enforce* floodplain management regulations in these zones.⁸⁹ For properties in these zones with a federally regulated or insured mortgage, flood insurance is mandatory.⁹⁰ Residents living outside a SFHA, including residents living behind levees, are not required to obtain insurance.⁹¹

FEMA has been notoriously slow in updating its maps and has not incorporated global climate change risk into its maps.⁹² Until 2003, FEMA

⁸⁵ NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS., MAPPING THE ZONE: IMPROVING FLOOD MAP ACCURACY, 19–20 (2009) [hereinafter NRC MAPPING THE ZONE]. The Risk Analysis Division of the Federal Insurance and Mitigation Administration, the FEMA division that manages NFIP, is responsible for mapping. FED. INS. & MITIGATION ADMIN., FED. EMERGENCY MGMT. AGENCY, FACT SHEET: FEDERAL INSURANCE AND MITIGATION ADMINISTRATION (2012), *available at* http://www.fema.gov/media-library-data/1464356203875-13a7afa1f593a3f137f5855b784498fa/FIMA_Overview_Fact_Sheet_2016r.pdf.

⁸⁶ NRC MAPPING THE ZONE, *supra* note 84. The area subject to inundation in a 1% annual chance flood is the Special Flood Hazard Area (SFHA), and includes floodplains and coastal storm surge zones. *Id.* The 100-year flood is another name for the 1% flood, but it can mislead people into thinking it only happens once every 100 years. *Id.* The areas that lay within the high-risk flood areas, SFHA, are designated as A, AE, V, or VE zones. 44 CFR § 59.1 (2015). The risk of flood reflects location and property characteristics such as “flood zone designation, elevation of the property relative to the community’s base flood elevation (BFE), building type, number of floors, presence of a basement, and the year the structure was built relative to the year of a community’s original flood map.” GAO-14-297R, *supra* note 83, at 16.

⁸⁷ In written testimony to Congress, FEMA administrator Craig Fugate indicated that the “in or out” nature of the SFHAs creates a credibility problem. *Examining the Reauthorization of the National Flood Insurance Program Hearing Before the S. Comm. on Banking, Hous., and Urban Affairs*, 112 Cong. 43 (2011) [hereinafter *Hearing*] (statement of W. Craig Fugate, Administrator, Federal Emergency Management Agency). His statement implies that more should be done to recognize the gradation of risk within a flood zone.

⁸⁸ GAO-14-297R, *supra* note 83, at 28, 30; *see also* FED. EMERGENCY MGMT. AGENCY, MANAGING FLOODPLAIN DEVELOPMENT THROUGH THE NATIONAL FLOOD INSURANCE PROGRAM: HOME STUDY COURSE 3-18 (1998) [hereinafter FEMA HOME STUDY COURSE], *available at* https://www.fema.gov/pdf/floodplain/is_9_complete.pdf.

⁸⁹ Once the community establishes these regulations, its residents are then eligible for insurance under NFIP. 44 C.F.R. § 59.2(b) (2015). *See also* FEMA HOME STUDY COURSE, *supra* note 87 at, 3-4, 5-4.

⁹⁰ National Flood Insurance Act of 1968, 42 U.S.C. § 4012a(a) (2012).

⁹¹ NICOLE T. CARTER, CONG. RESEARCH SERV., R42803, FEDERAL INVOLVEMENT IN FLOOD RESPONSE AND FLOOD INFRASTRUCTURE REPAIR: STORM SANDY RECOVERY 2 n.5 (2012) (“Notably absent from the reauthorization was mandatory flood purchase requirements for areas of residual risk—those areas that are protected by flood control measures (e.g., levees, dunes) but face flood risk if these measures are overwhelmed or fail.”).

⁹² Katherine Bagley, *Climate Change Impacts Absent from FEMA’s Redrawn NYC Flood Maps*, INSIDECLIMATE NEWS, Feb. 6, 2013, <http://insideclimatenews.org/news/20130204/climate-change-global-warming-flood-zone-hurricane-sandy-new-york-city-fema-federal-maps-revised-sea-level-rise> (last visited July 16, 2016).

largely relied on flood maps prepared in the 1970s and 1980s.⁹³ In 2003, FEMA began the digitization and improvement of its maps, planning to adopt a risk-based approach and improve standards and guidance.⁹⁴ In 2008, however, 50% of the nation's maps were at least 15 years old and 70% were at least 5 years old.⁹⁵

Although FIRMs have been sorely out of date and inaccurate in their delineation of the floodplain, some more recent technological advances promise to improve map accuracy. In 2009, FEMA began using the Risk MAP program to enhance mapping through “visual illustration of flood risk, analysis of the probability of flooding, economic consequences of flooding.”⁹⁶ Light Detection and Ranging (LIDAR) can provide more accurate flood maps because it gathers 3D information.⁹⁷ LIDAR employs a remote sensing method that uses light in the form of a pulsed laser to measure ranges to the Earth.⁹⁸ The expense of LIDAR technology has limited its use,⁹⁹ but the Obama Administration recently has shown an increased commitment to

⁹³ Al Shaw, Theodoric Meyer & Christie Thompson, *Federal Flood Maps Left New York Unprepared for Sandy—and FEMA Knew It*, PROPUBLICA, Dec. 6, 2013, <http://www.propublica.org/article/federal-flood-maps-left-new-york-unprepared-for-sandy-and-fema-knew-it> (last visited July 16, 2016). More than 70% of the maps were at least 10 years old: “many maps no longer accurately reflected current flood hazards.” *Hearing, supra* note 86, at 33 (statement of W. Craig Fugate, Administrator, Federal Emergency Management Agency).

⁹⁴ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-11-17, *FEMA FLOOD MAPS: SOME STANDARDS AND PROCESSES IN PLACE TO PROMOTE MAP ACCURACY AND OUTREACH, BUT OPPORTUNITIES EXIST TO ADDRESS IMPLEMENTATION CHALLENGES 1–2* (2010). The National Research Council noted in its 2009 assessment, however, that FEMA's map modernization project only resulted in 21% of the population having maps that meet the standards; the incomplete effort cost \$1 billion dollars. NRC MAPPING THE ZONE, *supra* note 84, at 1. Note that they covered 65% of the country that contained 92 percent of the population. Theodoric Meyer, *Why So Many Flood Maps Are Still Out of Date*, PROPUBLICA, July 8, 2013, <http://www.propublica.org/article/why-so-many-flood-maps-are-still-out-of-date> (last visited July 16, 2016).

⁹⁵ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-09-12, *FLOOD INSURANCE: FEMA'S RATE-SETTING PROCESS WARRANTS ATTENTION 18* (2008).

⁹⁶ *Hearing, supra* note 86, at 33 (statement of W. Craig Fugate, Administrator, Fed. Emergency Mgmt. Agency); FED. EMERGENCY MGMT. AGENCY, *WHAT IS RISK MAP?* (2012), available at https://www.fema.gov/media-library-data/20130726-1731-25045-8364/what_is_risk_map_factsheet_07_19_12.pdf.

⁹⁷ Patrick Marshall, *USGS Chips Away at High-Res 3D Map of the United States*, GCN, Aug. 29, 2014, <https://gcn.com/Articles/2014/08/29/USGS-3D-Lidar-Map.aspx> (last visited July 16, 2016); Meyer, *supra* note 93.

⁹⁸ An airplane flies over the area in question and uses the LIDAR to fire laser pulses in a beam that hit the ground and bounce back to the airplane, which generates data “about 10 times more accurate than old data.” Meyer, *supra* note 93.

⁹⁹ See Shaw, Meyer & Thompson, *supra* note 92 (discussing the expense of updating maps with new technology).

“Some states have considered the need for better maps as so urgent that they took it upon themselves to gather the data. North Carolina decided to pay for mapping the state using LIDAR after Hurricane Floyd in 1999: ‘We were concerned at the time that FEMA didn’t have the money,’ said John Dorman, the director of the North Carolina Floodplain Mapping Program.”

Id.

technologically improved maps.¹⁰⁰ As part of the 3D Elevation initiative, the Department of the Interior's U.S. Geological Survey and other federal agencies will partner to develop advanced 3D mapping data.¹⁰¹ This data will help with flood risk management, mitigation of coastal erosion, and storm surge impacts.¹⁰²

While FEMA has begun to improve its maps, problems persist. First, the mapping process remains very time-consuming. In the New York-New Jersey area, FEMA began a study to update coastal storm surge elevations in 2009, refined the maps after Hurricane Sandy, but the preliminary maps were not issued until January 30, 2015.¹⁰³ New York City has since filed a technical appeal of FEMA's preliminary maps which is still under review.¹⁰⁴ Second, complaints continue to emerge regarding the accuracy of the *new* maps with 89% of the 30,000 flood map amendment requests proving successful.¹⁰⁵ Third, the usefulness of the maps suffered from FEMA's lack of authority to

¹⁰⁰ See Press Release, Exec. Office of the President, Fact Sheet: Taking Action to Support State, Local, and Tribal Leaders as They Prepare Communities for the Impacts of Climate Change (July 16, 2014), <http://www.whitehouse.gov/the-press-office/2014/07/16/fact-sheet-taking-action-support-state-local-and-tribal-leaders-they-pre> (last visited July 16, 2016) (discussing President Obama responding to guidance from community leaders and federal agency action directed at developing advanced mapping data and tools).

¹⁰¹ *Id.*

¹⁰² *Id.*; see also U.S. Geological Survey, *3D Elevation Program*, <http://nationalmap.gov/3DEP/> (last visited July 16, 2016) (explaining that FEMA expects this project to reduce the time needed for updating maps and provide better information). This project is encouraging because funding for mapping had actually declined in recent years. Theodoric Meyer, *As Need for New Flood Maps Rises, Congress and Obama Cut Funding*, PROPUBLICA, May 24, 2013, <http://www.propublica.org/article/as-need-for-new-flood-maps-rises-congress-and-obama-cut-funding> (last visited July 16, 2016). In a 2013 series after Hurricane Sandy, journalist Theodoric Meyer noted that "Congress has cut funding for updating flood maps by more than half since 2010, from \$221 million down to \$100 million this year. And the president's latest budget request would slash funding for mapping even further to \$84 million — a drop of 62 percent over the last four years." *Id.*; see also KING, *supra* note 80, at 16–18.

¹⁰³ FED. EMERGENCY MGMT. AGENCY, PRELIMINARY FLOOD INSURANCE STUDY NUMBER 360497V000B 21 (2013), available at <http://www.nyc.gov/html/sirr/downloads/pdf/360497NY-New-York-City.pdf> (using the Advanced Circulation Model for Oceanic, Coastal and Estuarine Waters (ADCIRC) for stimulation of 2-dimensional hydrodynamics as well as the unstructured numerical wave model Simulating Waves Nearshore). Fed. Emergency Mgmt. Agency, Region II Coastal Analysis and Mapping: Preliminary Flood Maps & Data, <http://www.region2coastal.com/view-flood-maps-data/view-preliminary-flood-map-data> (last visited July 16, 2016).

¹⁰⁴ Corinne Ramey, *New York Disputes FEMA on Flood Risk*, WALL STREET J., Aug. 18 2015, <http://on.wsj.com/290VBHq> (last visited July 16, 2016).

¹⁰⁵ Miranda Leitsinger, *For Average Joes, Fighting FEMA Flood Maps Isn't Easy or Cheap*, NBC NEWS, Feb. 20, 2014, <http://www.nbcnews.com/news/us-news/average-joes-fighting-fema-flood-maps-isnt-easy-or-cheap-n23871> (last visited July 16, 2016). In several instances, new maps place homeowners in flood zones even though they are located at the top of a hill or nowhere near water. *Id.* In rural areas, digitization of maps may represent a matching of old lines and available engineering studies. Theodoric Meyer, *Using Outdated Data, FEMA is Wrongly Placing Homeowners in Flood Zones*, PROPUBLICA, July 18, 2013, <http://www.propublica.org/article/using-outdated-data-fema-is-wrongly-placing-homeowners-in-flood-zones> (last visited July 16, 2016) (explaining that the superimposition of modern satellite imagery on old maps often results in a "warping" effect that can erroneously show that homes on high ground are in the flood hazard area).

consider climate change's impacts, including rising sea levels, when updating flood maps.¹⁰⁶ Fortunately, the Biggert-Waters Act¹⁰⁷ has encouraged FEMA to incorporate climate change's likely impacts in its planning.¹⁰⁸

2. *Insufficient Land-Use Requirements*

The National Flood Insurance Act of 1968 instructs FEMA to “develop comprehensive criteria . . . [for] State and local measures . . . [to] constrict the development [in flood-prone areas.]”¹⁰⁹ Communities that want their residents to qualify for the NFIP must promulgate minimum land-use regulations in compliance with NFIP regulations.¹¹⁰ These NFIP regulations focus on prescribing building standards to minimize flood damage and apply to all new structures located in a SFHA. The building standards generally have reduced flood damage compared to structures built without the building standards.¹¹¹ But these standards neither incorporate changing

¹⁰⁶ GAO-14-297R, *supra* note 83, at 18, 37.

¹⁰⁷ Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No. 112-141, 126 Stat. 405, 924.

¹⁰⁸ § 100215, 126 Stat. at 924 (requiring the Technical Mapping Advisory Council (TMAC) to review a flood mapping program with technically credible flood hazard data before the Administrator can implement it). Note that FEMA has not yet established the TMAC, which is responsible for the report. *See* GAO-14-297R, *supra* note 83, at 30–31, 37 (the Act required FEMA to reestablish TMAC and for TMAC to produce reports with recommendations regarding the best available climate science and the best available methodology to consider the impact of rising sea levels, but TMAC only existed from 1995-2000, and even after the deadline for TMAC's report on July 6, 2013, TMAC had not been reestablished).

¹⁰⁹ Pub. L. No. 90-448, § 1302, 82 Stat. 476, 587 (1968). This language stems from the increased acceptance of Gilbert White's views. In 1945, Gilbert White's seminal thesis raised important concerns regarding the repeated failure of levees and other structures and the creation of a moral hazard situation for people living in flood-prone areas. Gilbert F. White, *Human Adjustment to Floods*, in 1 GEOGRAPHY, RESOURCES, AND ENVIRONMENT: SELECTED WRITINGS OF GILBERT F. WHITE 10, 12–13, 22–23 (Robert W. Kates and Ian Burton eds., 1986).

¹¹⁰ FEMA HOME STUDY COURSE, *supra* note 87, at 5-6. Structures must be designed and anchored to prevent flotation and collapse, constructed with materials below the Base Flood Elevation (BFE) that are flood resistant, designed to minimize flood damage, and enclosed spaces below the BFE can only be used for building access, parking, and storage. CHRISTOPHER JONES ET AL., AM. INSTS. FOR RESEARCH, EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM'S BUILDING STANDARDS 2–3 (2006), *available at* http://www.fema.gov/media-library-data/20130726-1602-20490-5110/nfip_eval_building_standards.pdf. The subset of homes within the SFHA that are in the V zone, or subject to wave velocity, must also meet the following requirements: (1) lowest floor must be at or above the BFE, (2) open foundations to allow floodwater to pass beneath elevated buildings, (3) any enclosures below the BFE must have screening, lattice, or breakaway walls, and (4) the building and its foundation must resist flotation, collapse or lateral displacement. *Id.* at 3–4.

¹¹¹ JONES ET AL., *supra* note 109, at viii.

Not all NFIP insurance provisions and premium rates promote better construction, however[,] Rogers (2005) has documented one scenario where the NFIP premium rate structure discourages a building practice, which reduces storm damage to structures. Many reports promote the use of pole-type construction, where the pilings extend from in the ground, past the lowest floor and to a higher floor or to the roofline. In situation where pole-type construction is used, the buildings sometimes are penalized by the NFIP through increased flood premiums and/or reduced flood policy coverage for the

conditions¹¹² nor protect against floods of a magnitude greater than the 100-year flood.¹¹³

NFIP has motivated flood prevention land-use regulation, but it also has allowed local governments to reinforce moral hazard behavior.¹¹⁴ Most local governments have not maximized floodplain management under the NFIP. NFIP only requires cities to address its land-use requirements within a SFHA;¹¹⁵ this limited scope disincentivizes more comprehensive local flood mitigation strategies.¹¹⁶

The NFIP's Community Rating System (CRS) ideally incentivizes communities to adopt stronger standards in exchange for reduced flood insurance premiums for their residents.¹¹⁷ The CRS "encourage[s] a comprehensive approach to floodplain management" through a point system.¹¹⁸ Communities receive credit points for 18 activities that relate to

structure and contents between the lowest floor and the floor at the top of the pilings. The effect of this "piling penalty" has been to encourage builders and owners to terminate piling foundations at the BFE, even though continuing the pilings upward to a higher floor results in buildings which better resist flood and wind damage. In cases where flood levels have exceeded the BFE, buildings with the pilings terminating at the BFE have experienced far greater damage than buildings with pilings extending to a higher floor.

Id. at 10.

¹¹² *Id.* at viii.

¹¹³ *Id.* at ix; see also NAT'L WILDLIFE FED'N, HEAVY RAINFALL AND INCREASED FLOODING RISK: GLOBAL WARMING'S WAKE-UP CALL FOR THE CENTRAL UNITED STATES (2008), available at https://www.nwf.org/~media/PDFs/Water/2008_HeavyRainfallandIncreasedFlooding_Report.aspx.

¹¹⁴ Chizewer & Tarlock, *supra* note 12, at 1760 n.116 (alteration in original) ("The reasons lie deep in the human psyche. The recent Congressional Research Service report observed that '[b]ehavioral scientists have noted that many individuals in flood-prone areas often dismiss low-probability catastrophic events, misunderstand the risk spreading function of insurance, and tend to be optimistic regarding the prospects of damage to their property.'" (quoting KING, *supra* note 80, at 3)). New Orleans is a classic example. After Hurricane Katrina, New Orleans officials successfully pressured FEMA to include the protection afforded by the federal government's \$14.5 billion flood control system in its flood maps. Property owners in many below sea-level areas no longer need flood insurance. However, "the new maps do not adequately highlight the shifting reality wrought by climate change." Andy Horowitz, Opinion, *Could New Orleans Flood Again?*, N.Y. TIMES, June 1, 2016, at A21.

¹¹⁵ *Id.* at 1762 (citing THOMAS V. CECH, PRINCIPLES OF WATER RESOURCES: HISTORY, DEVELOPMENT, MANAGEMENT, AND POLICY 78 (2003)). Each year the agency issues thousands of Letters of Map Change that often constrict previously mapped floodplain boundaries. *Id.* at 1763.

¹¹⁶ WILL HEWES & ANDREW FAHLUND, AM. RIVERS, WEATHERING CHANGE: POLICY REFORMS THAT SAVE MONEY AND MAKE COMMUNITIES SAFER 6 (2011), available at <http://www.cakex.org/sites/default/files/weathering-change-full-report.pdf>.

¹¹⁷ 42 U.S.C. § 4022(b) (2012). See also Charlene Luke & Aviva Abramovsky, *Managing the Next Deluge: A Tax System Approach to Flood Insurance*, 18 CONN. INS. L.J. 1, 9 (2011) (discussing the level of community participation in the CRS).

¹¹⁸ Nat'l Flood Ins. Program, Fed. Emergency Mgmt. Agency, *Community Rating System*, https://www.floodsmart.gov/floodsmart/pages/crs/community_rating_system.jsp (last visited July 16, 2016). The CRS also aims to "reduce flood damage to insurable property . . . [and] strengthen and support the insurance aspects of the NFIP." *Id.*; see ANN KILLIUS, VA. COASTAL POLICY CLINIC, SEA LEVEL RISE, STORMWATER MANAGEMENT AND THE NATIONAL FLOOD INSURANCE

2016]

SINK OR SWIM

511

mapping, damage reduction, preparedness and public information.¹¹⁹ Currently, 1,368 communities, representing 68% of policyholders, participate in the CRS.¹²⁰ The CRS has the potential to improve local planning, but it is a voluntary program and the benefits inure to the local residents as opposed to the municipalities.

C. Coastal Management Law and Flood Control

For coastal areas susceptible to increased flooding caused by sea level rise and extreme weather events, the CZMA and the CBRA theoretically offer an opportunity to keep citizens out of harm's way. Both statutes purport to check risky development along the coast, but both have fallen short in preventing moral hazard behavior. They have provided sufficient discretion for states and local governments determined to move ahead with flood-prone development. Both statutes remain potentially helpful to advance the goals of the climate resilience reforms.

1. Coastal Zone Management Act

The CZMA selectively superimposes federal law over state and local land-use decisions.¹²¹ The CZMA is the oldest federal program designed to check unlimited coastal development and to preserve the natural resiliency of coastal ecosystems.¹²² The CZMA tried to solve problems caused by fragmented and local control over coastal regions, or the preference of local governments' interests over the state and federal goals.¹²³ The CZMA's design reflects the desire to develop a more integrated approach to coastal

PROGRAM: HOW NORFOLK'S BEST MANAGEMENT PRACTICES CAN LOWER LOCAL FLOOD INSURANCE RATES 6 (2013) (explaining the CRS point system), *available at* <http://law.wm.edu/academics/programs/jd/electives/clinics/vacoastal/documents/march2014reports/sealevelrise.pdf>.

¹¹⁹ KILLIUS, *supra* note 117, at 6.

¹²⁰ FED. INS. & MITIGATION ADMIN., FED. EMERGENCY MGMT. AGENCY, FACT SHEET: COMMUNITY RATING SYSTEM (2015), *available at* http://www.fema.gov/media-library-data/1444399187441-5293d81167caaf062c2925b75a69215f/NFIP_CRS_Fact_Sheet-Oct-8-2015.pdf.

¹²¹ Cellular towers are another exception where federal regulatory programs were selectively superimposed over state and local land-use decisions. Telecommunications Act of 1996, Pub. L. No. 104-104, § 704, 110 Stat. 56, 151-52 (codified at 47 U.S.C. § 332(c)(7)(B) (2012)). There is no comprehensive federal program of "sensitive land" protection. Activities such as the filling of a wetland or development in the critical habitat of a listed endangered species require a federal permit in addition to compliance with all state and local regulations. Federal Water Pollution Control Act, 33 U.S.C. § 1344(a) (2012) ("The Secretary may issue permits, after notice and opportunity for public hearings for the discharge of dredged or fill material into the navigable waters at specified disposal sites."); Endangered Species Act of 1973, 16 U.S.C. § 1539(a)(1)-(2) (2012) (specifying that the Secretary can issue permits for takings).

¹²² Section 302(c) of the CZMA acknowledges that intensive development has caused the loss of living marine resources, adverse impacts on coastal ecosystems and shoreline erosion. CZMA, 16 U.S.C. § 1451(c) (2012).

¹²³ Barton H. Thompson, Jr., *A Federal Act to Promote Integrated Water Management: Is the CZMA a Useful Model?*, 42 ENVTL. L. 201, 219 (2012).

management that would protect federal interests, while recognizing the importance of state autonomy.¹²⁴

The voluntary program provides planning grants to states to develop coastal zone management programs and mandates federal consistency with state approved plans.¹²⁵ In exchange for adopting plans for coastal areas, states can deny development authority and licenses to federal activities if they are inconsistent with the state's program.¹²⁶

The CZMA's biggest weakness is that it does not mandate any particular set of elements. Section 309 does, however, encourage states to undertake enhancement projects across certain key areas: "wetlands, coastal hazards, public access, marine debris, cumulative and secondary impacts, special area management plans, ocean and Great Lakes resources, energy and government facility siting, and aquaculture."¹²⁷ In June 2014, NOAA amended its section 309 guidance to ensure greater consideration of climate change challenges in coastal management; state coastal plans must address coastal flooding as a result of sea level rise.¹²⁸ NOAA also will make \$1.5 million of competitive funding available to help states and tribes make improvements to their coastal management programs.¹²⁹ The guidance will help state and tribal coastal managers better prepare for the impacts of climate change and improve the safety of their communities.

2. Coastal Barrier Resources Act

The CBRA, adopted in 1982, employs a creative approach to coastal protection. It prohibits federal funding for development in designated coastal areas, based on the recognition that the federal government historically had permitted and subsidized development that resulted in "the loss of barrier resources, threats to human life, health, and property, and the expenditure of millions of tax dollars each year."¹³⁰

To prevent further damage, the CBRA requires the mapping of coastal barriers¹³¹ and prohibits certain development and many types of federal

¹²⁴ CZMA could have been integrated into a general, federal land-use planning program, but instead the United States has carved up its land base into a series of private, exclusive entitlements, exercised limited federal control to retained public lands, and enshrined the idea that land should be controlled at the lowest level of government, if at all. See BRIAN W. BLAESSER & ALAN C. WEINSTEIN, FEDERAL LAND USE LAW & LITIGATION § 8:42-44 (2014 ed.) (describing the state programs for local regulations for managing coastal land uses).

¹²⁵ See Thompson, *supra* note 122, at 219-20.

¹²⁶ 16 U.S.C. § 1456(d)(11)(C) (2012).

¹²⁷ NAT'L OCEANIC AND ATMOSPHERIC ADMIN., COASTAL ZONE MANAGEMENT ACT SECTION 309 PROGRAM GUIDANCE 1 (2014), available at https://coast.noaa.gov/czm/media/Sect-309_Guidance_June2014.pdf.

¹²⁸ *Id.* at 23-25.

¹²⁹ Exec. Office of the President, *supra* note 99.

¹³⁰ CBRA, 16 § 3501(a)(4) (2012).

¹³¹ *Id.* § 3503(f). Barrier is defined as a "depositional geologic feature" subject to "wave, tidal, and wind energies, and protects landward aquatic habitats from direct wave attack." *Id.* § 3502(1)(A).

expenditures in these protected areas.¹³² The types of prohibited federal expenses vary widely from financing or undertaking construction of roads and airports providing access to Coastal Barrier Resources System (CBRS) areas, to federal flood insurance, to emergency operations.¹³³ The CBRA does not prohibit privately funded development, but rather hopes that without the federal support developers will be deterred. The Act initially “designated 186 units, comprising about 453,000 acres along 666 miles of shoreline from Maine to Texas,” and now includes 585 units and 1.3 million acres.¹³⁴

The CBRA is a model for curbing moral hazard behavior in at-risk areas, because it has succeeded in saving significant federal dollars, according to the United States Fish and Wildlife Service (FWS).¹³⁵ These savings stem from averted disaster relief costs as well as construction costs.¹³⁶ FWS also notes, however, “[w]here the economic incentive for development is extremely high, the Act’s funding limitations can be overcome.”¹³⁷ Indeed, ten years after CBRA’s enactment, a General Accountability Office (GAO) Report determined that the program largely failed because 9 of the 34 CBRS units had undergone significant new development with more development planned.¹³⁸ In 2007, the GAO did a follow-up report and determined that even with limited federal financial assistance, in areas conducive and attractive to development, state or local governments that want the development provide their own subsidies.¹³⁹ Agencies also might have had difficulty determining

¹³² *Id.* § 3504. The Coastal Barrier Improvement Act of 1990 (CBIA), Pub. L. No. 101-591, 104 Stat. 2931 (codified as amended at 16 U.S.C. § 3503 (2012)) expanded the Coastal Barrier Resources System (CBRS) to include undeveloped coastal barriers along the Florida Keys, Great Lakes, Puerto Rico, and U.S. Virgin Islands. § 3, 104 Stat. at 2931. The CBIA also created a new category of coastal barriers called “otherwise protected areas” (OPAs), which are held and managed a qualified organization, primarily for wildlife refuge, sanctuary, recreational, or natural resource conservation purposes. § 12, 104 Stat. at 2940; U.S. Fish & Wildlife Serv., *CBRA Legislation and Testimony*, <http://www.fws.gov/ecological-services/habitat-conservation/cbra/Act/Legislation.html> (last visited July 16, 2016) (explaining the changes made by Congress via the CBIA).

¹³³ 44 C.F.R. § 206.344 (2015). Exceptions to this limit are made for energy exploration, emergency assistance, and repair of existing roads. *Id.* § 206.345.

¹³⁴ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO-07-356, COASTAL BARRIER RESOURCES SYSTEM: STATUS OF DEVELOPMENT THAT HAS OCCURRED AND FINANCIAL ASSISTANCE PROVIDED BY FEDERAL AGENCIES 7 (2007) [hereinafter GAO-07-356].

¹³⁵ U.S. FISH & WILDLIFE SERV., THE COASTAL BARRIER RESOURCES ACT: HARNESSING THE POWER OF MARKET FORCES TO CONSERVE AMERICA’S COASTS AND SAVE TAXPAYERS’ MONEY 1–3 (2002) (estimating a savings from 1983 through 1996 of about \$686,000,000), *available at* <http://www.fws.gov/cbra/Docs/TaxpayerSavingsfromCBRA.pdf>.

¹³⁶ *Id.* at 2.

¹³⁷ *Id.* at 4.

¹³⁸ U.S. GOV’T ACCOUNTABILITY OFFICE, GAO/RCED 92-115, COASTAL BARRIERS: DEVELOPMENT OCCURRING DESPITE PROHIBITIONS AGAINST FINANCIAL ASSISTANCE, 24–25 (1992). The report also noted that, “[f]or example, the CBRS unit in North Bethany Beach, Delaware, contained only two single-family residences in 1982. From October 1, 1983, to October 1, 1990, the number of such residences that have received permits increased to 74. If the development currently planned occurs, the number of residences will eventually increase to 81. Two of the 10 federal agencies GAO contacted on the issue of financial assistance provided such assistance within the CBRS contrary to CBRA’s prohibitions.” *Id.* at 3–4.

¹³⁹ GAO-07-356, *supra* note 133, at 14.

whether the properties in question were within the CBRS based on mapping problems.¹⁴⁰

The ability to deter development in the CBRS depends significantly on the state and local attitudes toward these lands.¹⁴¹ The CBRA experience only reinforces the need for state and local collaboration with the federal program or willingness to impose more stringent floodplain controls.¹⁴²

D. Disaster and Housing Law and Flood Control

The intersection of flood control law and disaster law provides another opportunity for local governments to proactively manage increased flood risks.¹⁴³ Disaster law historically focused on post-disaster relief, but now includes prevention and damage mitigation.¹⁴⁴

1. Hazard Mitigation Planning

The Stafford Disaster Act¹⁴⁵ established a framework for states and local governments to engage in adaptive planning to reduce damages associated with natural disasters.¹⁴⁶ The Stafford Act requires states to submit Hazard Mitigation Plans for FEMA approval and then incentivizes states to act by issuing hazard mitigation plan grants.¹⁴⁷ Hazard mitigation is defined as “sustained action taken to reduce or eliminate the long-term risk to human life and property from hazards.”¹⁴⁸

As of 2013, 25,000 communities have submitted hazard mitigation plans.¹⁴⁹ The hazard mitigation plans include a risk assessment of natural hazards,¹⁵⁰ which can encompass consideration of climate change. Soon, however, states may be required to build climate change impacts into these hazard mitigation plans.¹⁵¹

FEMA has the authority to fund hazard mitigation activities, which it defines as “[a]ny cost effective measure which will reduce the potential for

¹⁴⁰ *Id.* at 17–18. Much like the FEMA maps, the CBRA maps have been inaccurate and/or confusing—where adjacent homes may not be treated in kind. The 2000 reauthorization of the CBRA included funding for digital mapping. pilot project. Coastal Barrier Resources Reauthorization Act of 2000, Pub. L. No. 106-514, § 6, 114 Stat. 2394, 2396.

¹⁴¹ KLEIN & ZELLMER, *supra* note 62, at 1530.

¹⁴² *Id.* at 1529–30.

¹⁴³ See ERNEST B. ABBOTT ET AL., STATE, LOCAL, AND FIRST RESPONDER ISSUES (2006), reprinted in DANIEL A. FARBER & JIM CHEN, DISASTERS AND THE LAW: KATRINA AND BEYOND 79 (2006).

¹⁴⁴ FARBER & CHEN, *supra* note 142, at 102–03, 201.

¹⁴⁵ Robert T. Stafford Disaster Relief and Emergency Assistance Act (Stafford Act), 42 U.S.C. §§ 5121–5208 (2012).

¹⁴⁶ *Id.* § 5121.

¹⁴⁷ *Id.* §§ 5165–5165a.

¹⁴⁸ 44 C.F.R. § 201.2 (2015).

¹⁴⁹ FEMA INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING, *supra* note 43, at 1-2.

¹⁵⁰ *Id.* at 5-1.

¹⁵¹ Exec. Office of the President, *supra* note 99; see also *infra* notes 196 and 197 and accompanying text.

damage to a facility from a disaster event.”¹⁵² Some structural flood control projects are eligible.¹⁵³ Efforts to move citizens out of harm’s way—property acquisition and elevation requirements/changes—are also included. Vegetative management and stormwater management—system-wide projects—can qualify for funding.¹⁵⁴ State and local governments must contribute 25% of the costs.¹⁵⁵

The Hazardous Mitigation Grant Program (HMGP) provides an important source of funding for flood management, but the current structure has not encouraged planning for climate change. Hazard mitigation grant applicants must prove that the project is cost-effective.¹⁵⁶ FEMA’s cost-effectiveness calculation requires that the problem be “repetitive” and relies on historical data such as FIRMs, but it does not consider “the long-term changes in flood risks from sea-level rise and climate change.”¹⁵⁷ This approach inherently discourages forward looking planning. Because the current HMGP structure gives the money to the states, which then distribute the money to the local government sub grantees, local governments are competing within each state for funding and must manage another layer of bureaucracy.¹⁵⁸

A 2013 FEMA report recognizes that state and local governments have typically not integrated their hazard mitigation plans with other local plans.¹⁵⁹ The report emphasizes the importance of integrating hazard mitigation planning with other community planning to achieve greater resilience.¹⁶⁰ It also gives local governments strategies for incorporating this information into planning and provides case studies.¹⁶¹ Effective March 2016,

¹⁵² 44 C.F.R. § 206.2(14) (2015); see NICOLE SMITH & JESSICA GRANNIS, UNDERSTANDING THE ADAPTATION PROVISIONS OF THE SANDY DISASTER RELIEF APPROPRIATIONS ACT (H.R. 152), (Discussion Draft 2013), available at http://www.georgetownclimate.org/sites/www.georgetownclimate.org/files/GCC_Sandy_Relief_Act_Analysis.pdf

¹⁵³ 44 C.F.R. § 206.434(c)(2) (2015). See SMITH & GRANNIS, *supra* note 151 at 14 n.73 (noting that seawall construction is an eligible cost).

¹⁵⁴ SMITH & GRANNIS, *supra* note 151 at 14.

¹⁵⁵ “The President may contribute up to 75 percent of the cost of hazard mitigation measures which the President has determined are cost-effective and which substantially reduce the risk of future damage, hardship, loss, or suffering in any area affected by a major disaster.” Stafford Act, 42 U.S.C. § 5170c(a) (2012).

¹⁵⁶ 44 C.F.R. § 206.434(c)(5) (2015).

¹⁵⁷ See SMITH & GRANNIS, *supra* note 151 at 14–15.

¹⁵⁸ See CITY OF N.Y., PLANYC: A STRONGER, MORE RESILIENT NEW YORK 404 (2013) (allowing nonprofit hospitals to apply directly to the State of New York for section 404, 42 U.S.C. § 5170c (2012), funding in order to circumvent some bureaucracy).

¹⁵⁹ FEMA INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING, *supra* note 43, at 2-2.

¹⁶⁰ *Id.* at 2-1.

¹⁶¹ *Id.* For examples of local governments incorporating those strategies, see, e.g., Robert R.M. Verchick & Abby Hall, *Adapting to Climate Change While Planning for Disaster: Footholds, Rope Lines, and the Iowa Floods*, 2011 BYU L. REV. 2203, 2235–49 (2011) (describing an EPA-led project in Iowa, which promoted the consideration of climate change in hazard mitigation plans); Chizewer & Tarlock, *supra* note 12, at 1768–91 (reviewing local and regional flood damage prevention programs).

state mitigation plans must take into consideration climate change impacts.¹⁶²

2. Community Development Block Grants

The Housing and Community Development Act of 1974,¹⁶³ administered by Housing and Urban Development (HUD) provides another source for state and local post-flood recovery efforts—the Community Development Block Grants (CDBG).¹⁶⁴ After a disaster, Congress provides supplemental appropriations to HUD,¹⁶⁵ which then uses the CDBG program to meet “community development needs having a particular urgency because existing conditions pose a serious and immediate threat to the health or welfare of the community.”¹⁶⁶ The CDBG funds supplement assistance under the Stafford Act.¹⁶⁷ As explained by HUD, “[t]hese communities must have significant unmet recovery needs and the capacity to carry out a disaster recovery program (usually these are governments that already receive [HOME Investment Partnership Program (HOME)] or CDBG allocations).”¹⁶⁸ Further, “fifty percent of the funds must support persons of low or moderate income, unless the Secretary waives this requirement based upon a finding of compelling need.”¹⁶⁹

State and local government grantees have substantial discretion in using the funds and can use the money “to acquire real property, demolish structures, prepare sites for development, to establish revolving funds, and

¹⁶² FED. EMERGENCY MGMT. AGENCY, FP 302-094-2, STATE MITIGATION PLAN REVIEW GUIDE 13 (2015) [hereinafter FEMA FP 302-094-2], available at http://www.fema.gov/media-library-data/1425915308555-aba3a873bc5f1140f7320d1ebbd18c6/State_Mitigation_Plan_Review_Guide_2015.pdf.

¹⁶³ 42 U.S.C. §§ 5301–5321 (2012).

¹⁶⁴ SMITH & GRANNIS, *supra* note, 151 at 15–16.

¹⁶⁵ *Id.* at 16. In the wake of Hurricane Sandy, Congress appropriated \$16 billion to the CDBG program. Disaster Relief Appropriations Act of 2013, Pub. L. No. 113-2, 127 Stat. 4, 36. That number was reduced to \$15.1 billion through the sequestration process. See Third Allocation, Waivers, and Alternative Requirements for Grantees Receiving Community Development Block Grant Disaster Recovery (CDBG–DR) Funds in Response to Disasters Occurring in 2013, 80 Fed. Reg. 1,039, 1,039 (Jan. 8, 2015) (discussing sequestration process). In its allocations of funding for the post-Sandy relief, HUD set expectations: “For the disasters covered by this Notice, HUD has required that grantees use their funds in a way that results in rebuilding back stronger so that future disasters do less damage and recovery can happen faster.” *Id.* at 1,043.

¹⁶⁶ SMITH & GRANNIS, *supra* note 151, at 16 (citing 24 C.F.R. § 570.200(a)(2) (2013)). This is one of the three national priorities that must be met by CDBG-funded activities; the other two priorities include 1) benefit low- and moderate-income families, or 2) aid in the prevention or elimination of slums or blight. *Id.* at 15–16.

¹⁶⁷ *Id.* at 17.

¹⁶⁸ U.S. Dep’t of Hous. & Dev., *HUD Exchange: CDBG-DR Eligibility Requirements*, <https://www.hudexchange.info/cdbg-dr/cdbg-dr-eligibility-requirements> (last visited July 16, 2016).

¹⁶⁹ SMITH & GRANNIS, *supra* note 151, at 16.

2016]

SINK OR SWIM

517

to support economic development, among other things.”¹⁷⁰ Local governments can use the money to mitigate future hazards.¹⁷¹

The availability of support from the federal government through the CBDG and HMGP programs can help a local government move from disaster to forward looking planning, but these programs lack the breadth and depth needed to obtain the full level of change needed. The financial constraints on the Corps’ ability to plan on the larger scale also hinder integrated management. The NFIP has improved modestly, but it does not provide sufficient disincentives to moral hazard behavior. Considering that no sweeping legislative changes will happen in the near future, we must consider whether the climate reforms can provide an effective solution.

IV. WILL CLIMATE RESILIENCE REFORMS IMPROVE FEDERAL FLOOD MANAGEMENT?

The Obama Administration’s climate resilience reforms, if fully implemented by the governing federal agencies, will move federal flood management toward an integrated and risk-based approach based on climate science. The executive directives have happened at a time when no reforms with the word “climate” could make their way through Congress. They promote innovative solutions and encourage planning based on improved climate data to help analyze sea level rise and other key indicators.¹⁷² They call for land-use and other local planning that considers hazard mitigation and provide incentives for local governments to take action.

Will the reforms repair a broken flood management system? Although the reforms should improve flood management, they do not make the system whole because they are executive actions, they do not replace existing federal laws, and they may not provide another financial or structural support for local governments. This Part analyzes expected federal advances and barriers to achieving integrated flood management. Part V will consider local government authority and action related to flood management, and the impact of changed federal flood policy on local efforts.

A. Limits of Climate Resilience Executive Actions

Despite some cause for optimism, the climate reforms have limits. Because these actions are executive as opposed to legislative, they may

¹⁷⁰ *Id.* at 15.

¹⁷¹ *Id.*

¹⁷² NOAA has encouraged the pursuit of climate science through incentives, provides climate data to help support analysis and preparation of changing weather, and measures the impacts of climate changes to sea level rise, etc. See Nat’l Oceanic & Atmospheric Admin., *Climate.gov: Science & Information for a Climate-Smart Nation*, <http://www.climate.gov/> (last visited July 16, 2016); Nat’l Ctrs. for Envtl. Info., Nat’l Oceanic & Atmospheric Admin., *National Centers for Environmental Information*, <http://www.ncdc.noaa.gov/> (last visited July 16, 2016).

prove vulnerable to political blowback.¹⁷³ First, Republicans have challenged them in the media and will likely challenge them in court.¹⁷⁴ “They also argue that in light of Congress’s failure to enact new legislation addressing climate change, the president has overstepped the bounds of his constitutional authority.”¹⁷⁵ In response to Executive Order 13,690, seven Republican senators wrote a letter to the President challenging his authority.¹⁷⁶ Executive orders typically withstand legal challenge,¹⁷⁷ but a legal challenge may erode its legitimacy with local governments. Also, the anticipation of a challenge necessarily constrains the drafting of the executive order on the front end. Commentators have noted that Executive Order 13,690 is conservative in that many local governments already use those flood standards now.¹⁷⁸ Further, Executive Order 13,690 deliberately avoids addressing NFIP insurance rates.¹⁷⁹

In light of the 2014 repeal of the Biggert-Waters Act provisions imposing new insurance rates,¹⁸⁰ the President may have foreseen that challengers would misrepresent the nature of the new directive; he likely included the insurance rate limit to reassure citizens that their insurance rates would be

¹⁷³ And, of course, when a new president takes office, the entire climate resilience enterprise could fall, much as Australian climate change efforts disappeared when Prime Minister Tony Abbott took office. For a political cartoon that depicts the shift, see Cathy Wilcox, <https://s-media-cache-ak0.pinimg.com/236x/21/0e/be/210ebee9fb1da2f8e8943a2cdb459ffa.jpg> (last visited July 16, 2016).

¹⁷⁴ Ariane de Vogue et al., *Supreme Court Blocks Obama Climate Change Rules*, CNN, Feb. 10, 2016, <http://www.cnn.com/2016/02/09/politics/supreme-court-obama-epa-climate-change/> (last visited July 16, 2016).

¹⁷⁵ Robert V. Percival, *Presidential Power to Address Climate Change in an Era of Legislative Gridlock*, 32 VA. ENVTL. L.J. 134, 149 (2014).

¹⁷⁶ Letter from Sens. Thad Cochran (R-Miss.), David Vitter (R-La.), John Cornyn (R-Tex.), Johnny Isakson (R-Ga.), Roger Wicker (R-Miss.), Roy Blunt (R-Mo.), John Boozman (R-Ark.), & Bill Cassidy (R-La.), to President Barack Obama (Feb. 5, 2015) (questioning whether President Obama sought input from mayors and other stakeholders which they argue was necessary before proceeding), *available at* http://www.cochran.senate.gov/public/_cache/files/815d07f4-7aee-40ad-a97f-1701c8a44829/Letter%20to%20POTUS_FFRMS_05FEB2015.pdf.

¹⁷⁷ Only a few executive orders have been deemed unconstitutional. *See, e.g.*, *Youngstown Sheet & Tube Co. v. Sawyer*, 343 U.S. 579, 654–55 (1952) (Jackson, J., concurring) (declaring unconstitutional the President’s executive order directing the Secretary of Commerce to take possession of and operate most of the Nation’s steel mills).

¹⁷⁸ *See, e.g.*, Rachel Cleetus, *Sea Level Rise, Growing Flood Risks, and the Need for a Strong Federal Flood Risk Management Standard*, UNION OF CONCERNED SCIENTISTS: THE EQUATION, (May 5, 2015, 12:12 PM) <http://blog.ucsusa.org/rachel-cleetus/sea-level-rise-and-need-for-strong-federal-flood-risk-management-standard-725> (explaining that hundreds of communities have already adopted standards consistent with Federal Flood Risk Management Standard); Katherine Bagley, *Congress Actually Dealt with Climate Change in the 2015 Budget Bill. Really.*, INSIDECLIMATE NEWS, Jan. 19, 2016, <http://insideclimatenews.org/news/11012016/congress-climate-change-omnibus-budget-bill-flood-standard-obama> (last visited July 16, 2016) (noting that numerous local governments were already enforcing stricter building standards for flood zones); *see also* Council on Env’tl. Quality, *supra* note 4 (explaining that hundreds of communities have “adopted standards which meet or exceed [the] new Federal standard.”).

¹⁷⁹ Berginnis, *supra* note 34, at 16.

¹⁸⁰ Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, 128 Stat. 1020.

unaffected.¹⁸¹ Even if the executive orders themselves are not struck down, the agency regulations, promulgated pursuant to the executive orders, also could become targets.¹⁸²

The executive orders are also limited because they provide direction only to federal agencies rather than states and local governments. Without a federal mandate, local governments that do not have the resources or political will to factor in climate change impacts into their planning will continue to do nothing.

Similarly, reluctant federal agencies have some opportunities to avoid implementation, especially if resources are tight.¹⁸³ Political pressures can push agencies or local governments to resort to hard structures to please residents in the short-term.¹⁸⁴ For example, the plan to protect beachfront homes lapped by the ocean in Fire Island, New York likely reflects such pressures. The Corps and Suffolk County have developed a plan to spend \$170 million to create a new dune line.¹⁸⁵ Forty-one houses are targeted for purchase at a cost of \$46 million (largely borne by the federal government); other property owners have donated dune easements.¹⁸⁶ The rub is that no one knows how long the dunes will last, but the mostly second-home dwellers will continue to enjoy summer at the beach until the next big storm.¹⁸⁷

B. Climate Resilience Reforms and Federal Law

If the climate resilience reforms stand, will they move federal agencies toward more effective flood policy? Importantly, the reforms signify a commitment and leadership at the highest level.¹⁸⁸ The Obama Administration has boosted improved, science-based data to inform federal

¹⁸¹ In fact, the National Association of Floodplain Managers has predicted that the insurance rates may go down because the measures will entitle the insured for more discounts. Berginnis, *supra* note 34, at 16.

¹⁸² In the absence of legislation addressing climate change mitigation, EPA acted under its Clean Air Act (CAA), 42 U.S.C. §§ 3103–3233 (2012), authority to regulate greenhouse gases (GHGs) were pollutants. *See Massachusetts v. U.S. Envtl. Prot. Agency*, 549 U.S. 497, 532–5 (2007) (holding that GHG were pollutants under the CAA and requiring EPA to undertake the endangerment analysis). Once EPA made an endangerment finding, it proceeded to use the CAA to develop standards relating to GHGs for tailpipe emissions as well as stationary sources. *See Util. Air Regulatory Grp. v. U.S. Envtl. Prot. Agency*, 134 S. Ct. 2427, 2449 (2014) (rejecting EPA's argument that a source's GHG emissions triggered the Prevention of Significant Deterioration (PSD) program's permitting requirements, but allowing the PSD program to apply to already covered, "anyway" facilities' GHG emissions).

¹⁸³ Flatt, *supra* note 10, at 170–71.

¹⁸⁴ *See, e.g.,* Lisa W. Foderaro, *The Last Summer on the Beach*, N.Y. TIMES, July 19, 2015, at MB1 (explaining that Long Island local residents and elected officials consider a beach renourishment project at Fire Island "a crucial bulwark for the mainland").

¹⁸⁵ Joseph Berger, *Plan to Fortify Weak Shore Faces Dispute on Fire Island*, N.Y. TIMES, May 28, 2014, at A18.

¹⁸⁶ *Id.*

¹⁸⁷ *Id.*

¹⁸⁸ GAO-15-290, *supra*note 1, at 69.

and local decisions.¹⁸⁹ These executive directives charge federal agencies with integrating climate change's potential impacts into decision making; the federal agencies have already begun to shift their flood management policies and planning documents. In addition to the climate-oriented reforms, some recent legislative changes also will improve flood management. These reforms sit atop of an existing, fractured system, however, and most likely will not cure all the ills caused by this uncoordinated approach.

1. Positive Impacts on Federal Law/Policy

a. Leadership

The Obama Administration has demonstrated its commitment to preparing the nation for climate change's impacts. As detailed in Part I above, task forces and directives seem to build on each other's progress and create some momentum for change at the federal level. This momentum is reflected in agency action.

b. Agency Action

In response to the executive directives, federal agencies have prepared new adaptation plans, have developed resources for state and local governments, and begun to demonstrate a commitment to developing climate resilience. For instance, the Corps' NACCS report and National Nonstructural Floodproofing Committee provide a risk management framework that reflects a shifted approach, including the Corps' use of nonstructural tools to prevent floods.¹⁹⁰ FEMA has begun, albeit slowly, to move toward including forward-looking data in developing FIRMs.¹⁹¹ In addition, FEMA released new guidance for state hazard mitigation plans, the State Mitigation Review Guide, that directly calls upon states to reduce risk by considering changing climate conditions.¹⁹² FEMA and NOAA also have been building models that better apply climate data at the local level.¹⁹³

¹⁸⁹ See, e.g., NAT'L OCEANIC & ATMOSPHERIC ADMIN., *supra* note 126, at 9 (discussing guidance requiring the Office of Coastal Resource Management to consider data collection and synthesis).

¹⁹⁰ NACCS, *supra* note 8, at i. "Nonstructural measures addressed by the [Corps'] National Nonstructural Floodproofing Committee include structure acquisitions or relocations, flood proofing of structures, implementing flood warning systems, flood preparedness planning, establishment of land use regulations, development restrictions within the greatest flood hazard areas, and elevated development." DIRECTORATE OF CIVIL WORKS, U.S. ARMY CORPS OF ENG'RS, CWTS 2013-3, COASTAL RISK REDUCTION AND RESILIENCE: USING THE FULL ARRAY OF MEASURES 5 (2013).

¹⁹¹ U.S. GOV'T ACCOUNTABILITY OFFICE, GAO-15-28, CLIMATE CHANGE: BETTER MANAGEMENT OF EXPOSURE TO FUTURE LOSSES IS NEEDED FOR FEDERAL FLOOD AND CROP INSURANCE 19 (2014).

¹⁹² FEMA FP 302-094-2, *supra* note 162, at 3, 13.

¹⁹³ *Id.*

c. Legislative Baby Steps (and Falls)

Several areas of the NFIP potentially offer areas for improved flood management: 1) Biggert-Waters Act reforms relating to mapping, 2) increased use of Community Rating System incentives, and 3) climate resilience reforms relating to the availability and incorporation of climate data into FEMA's actions.

The Biggert-Waters Act of 2012 represented a bipartisan effort to improve actuarial soundness and program solvency. It eliminated "grandfathered" premium subsidies on second homes, severe repetitive loss properties and properties that have incurred flood-related damage exceeding the fair market value of the property.¹⁹⁴ It also put measures in place to improve map accuracy.¹⁹⁵ In a shortsighted move, Congress passed the Homeowner Flood Insurance Affordability Act of 2014, which repealed many of the rate-related reforms.¹⁹⁶ It left intact reforms that push FEMA to develop more accurate flood maps including consideration of future conditions.¹⁹⁷ A more risk-based approach to flood mapping, with the establishment of the Technical Mapping Advisory Council, should improve map quality. The creation of a Scientific Resolution Panel to address homeowner challenges to flood map revisions also should improve decisions.¹⁹⁸

Concern about increasing rates may have motivated municipalities to seek discounts, through adopting more protective measures, eligible through the CRS.¹⁹⁹ Climate resilience reforms most likely will improve NFIP because it promises better climate data, requires agencies to factor in climate change adaptation to its activities, and will require federal agencies to meet higher federal flood risk management standards in the floodplain.

2. Obstacles for Implementing Climate Reforms into Federal Flood Policy

While the climate resilience reforms have forced agencies to consider and plan for climate change in their flood management programs, the

¹⁹⁴ See Biggert-Waters Flood Insurance Reform Act of 2012, Pub. L. No. 112-141, § 100207, 126 Stat. 405, 919 (requiring flood insurance premiums to reflect the current risk of flood); see also Fed. Emergency Mgmt. Agency, *Biggert-Waters Flood Insurance Reform Act of 2012 (BW12) Timeline*, http://www.fema.gov/media-library-data/20130726-1912-25045-8239/bw_time_line_table_04172013.pdf (last visited July 16, 2016) (explaining that the Biggert-Waters Act "calls for the phase-out of subsidies and discounts on flood insurance premiums" for owners of non-primary residences, business owners, and owners of property that has sustained flood damage that exceeds the value of the home).

¹⁹⁵ § 100216, 126 Stat. at 927 (2012).

¹⁹⁶ Homeowner Flood Insurance Affordability Act of 2014, Pub. L. No. 113-89, § 3, 128 Stat. 1020, 1021.

¹⁹⁷ § 30, 128 Stat. at 1034-35 (indicating that the only amendments made to the mapping provisions in the Biggert-Waters Act are related to notification and timing requirements).

¹⁹⁸ § 100218, 126 Stat. at 930-32 (codified at 42 U.S.C. § 4104-1(a) (2012)).

¹⁹⁹ See KILLIUS, *supra* note 117, at 6.

implementation of these changes may face several obstacles: funding, coordination, and lack of mandatory requirements.

a. Fiscal Issues

The Obama Administration has shown commitment to advancing the federal government's approach to flood management, but federal funding for flood management has generally declined over the last fifteen years.²⁰⁰ Some of the newer efforts have been funded through special post-disaster bills or special projects.²⁰¹ Without more certain fiscal support, federal agencies will likely find themselves hamstrung and forced to choose between competing priorities.

b. Lack of Coordination

The interagency climate-related task forces have enabled the governing agencies to shape the executive directives, making them more implementable. Still, the ultimate change required by the directives happens within the individual silos of each agency. Because so many agencies are involved in flood management, the success of the reforms will vary between agencies and one agency's reform may not coordinate with another agency's action. The GAO remains concerned about the lack of coordination both among federal agencies and between federal, state and local governments: "[E]xisting actions and strategies do not clearly define the roles, responsibilities, and working relationships among federal, state, local, and private-sector entities, or how such efforts will be funded, staffed, and sustained over time."²⁰²

c. Weak Enforcement

The concerns regarding coordination spill over to lack of monitoring and enforcement. As GAO has pointed out: "There are no programs to monitor and independently validate the effectiveness and sustainability of federal efforts to reduce the fiscal exposure posed by climate change. Thus, there is no way to demonstrate progress in implementing corrective

²⁰⁰ See DANIEL J. WEISS ET AL., CTR. FOR AM. PROGRESS, HEAVY WEATHER: HOW CLIMATE DESTRUCTION HARMS MIDDLE- AND LOWER-INCOME AMERICANS 33-34 (2012) (discussing the declining appropriations for predisaster mitigation programs).

²⁰¹ See, e.g., Matt Long, *President Obama Signs Spending Bill that Includes Flood Relief to South Carolina*, S.C. RADIO NETWORK, Dec. 18, 2015, <http://www.southcarolinaradionetwork.com/2015/12/18/president-obama-signs-spending-bill-that-includes-flood-relief-to-sc/> (last visited July 16, 2016) (discussing \$300 million appropriated for disaster relief in several states through a post-disaster bill).

²⁰² GAO-15-290, *supra* note 1, at 69.

measures.”²⁰³ Accordingly, it is unclear whether the reforms will prove fiscally effective or protective of the citizenry.

V. WILL CLIMATE REFORMS IMPROVE LOCAL FLOOD MANAGEMENT?

The climate reforms also necessarily interplay with local flood-related policy. The existing federal legislative regime has led to uncoordinated competition among local entities for dwindling federal funds for structural “risk elimination” solutions.²⁰⁴ On their own, though, some local governments have led the way in adapting to increased flooding. This Part considers some examples of model local government approaches, available tools and obstacles, and the intersection of the climate reforms with local action. The federal, climate reforms call for innovative local planning that considers hazard mitigation. They are also flexible enough to allow local governments to forge ahead with progressive plans that may go beyond the federal recommendations.

A. Local, Adaptive Planning

Even before the recent federal reforms, and in the absence of specific or comprehensive federal requirements for state and local planning, cities and counties that face high flood risks began taking forward, climate change-based management steps. More integrated approaches to planning include the coordination of hazard mitigation planning with other land-use documents.

Post-Sandy New York City and Miami-Dade County provide two examples of innovative adaptive planning, but many other local governments have begun similar efforts. For instance, New Orleans released a new master plan in 2010, titled “Plan for the 21st Century: New Orleans 2030” and issued the New Orleans Comprehensive Zoning Ordinance at the same time to ensure that the documents conformed to each other.²⁰⁵

Private and public initiatives have supported these efforts. In the wake of Hurricane Sandy, the Obama Administration launched the Rebuild by

²⁰³ *Id.*

²⁰⁴ The President’s Budget for fiscal year 2016 allocates \$4.732 billion for the Civil Works program of the Corps. Only \$34 million is allocated for flood control and coastal emergencies. See Press Release, U.S. Army Corps of Eng’rs, President’s Fiscal 2016 Budget for U.S. Army Corps of Engineers Civil Works Released (Feb. 2, 2015), <http://www.usace.army.mil/Media/NewsReleases/NewsReleaseArticleView/tabid/231/Article/562964/presidents-fiscal-2016-budget-for-us-army-corps-of-engineers-civil-works-releas.aspx>. Both Democrats and Republicans in Congress have criticized continued shrinkage of the Corps’ budget. Sarah Gonzales, *Appropriators say Corps of Engineers needs more, but not for WOTUS*, AGRI-PULSE, Feb. 11, 2015, <http://www.agri-pulse.com/Congress-annoyed-low-Army-Corps-budget-proposal-02112015.asp> (last visited July 16, 2016).

²⁰⁵ See 1 CITY OF NEW ORLEANS, PLAN FOR THE 21ST CENTURY: NEW ORLEANS 2030 7 (2010), available at <http://www.nola.gov/getattachment/4dcf72fd-b189-4937-bd69-dba2958a483e/Vol-1-Executive-Summary/>, for an analysis of the planning struggles that followed Hurricane Katrina. See also GARY RIVLIN, *KATRINA: AFTER THE FLOOD passim* (2015).

Design competition. The competition sought “innovative community- and policy-based solutions to protect U.S. cities that are most vulnerable to increasingly intense weather events and future uncertainties.”²⁰⁶ The project connected experts with local planners and citizens to help create “environmentally- and economically-healthier” solutions.²⁰⁷ The “100 Resilient Cities Campaign,” launched by the Rockefeller Foundation, broadly aims to help cities become more resilient to physical, economic, and social challenges.²⁰⁸ It provides financial and logistical guidance, and access to expert advisors to create a network of resilient cities, and a model for resilience.²⁰⁹

New York City has taken significant action to plan for climate change through its Commission on Climate Change, its PlaNYC process, its involvement in the Rebuild by Design program, and zoning changes. The PlaNYC process has led to 257 initiatives to improve resilience.²¹⁰ After Hurricane Sandy, the city changed its building code to require buildings to protect to a level one or two feet higher than FEMA-designated flood elevation.²¹¹ In turn, the City Council passed the Flood Resilience Text Amendment, which modifies zoning to enable flood-resistant construction.²¹²

When New York City began to consider how to restore midtown to lower Manhattan, an area substantially damaged by Hurricane Sandy, it relied on climate models and considered the 500-year-flood-area for the year 2050.²¹³ This forward-looking choice will provide the city a higher level of protection than if it had relied on FEMA’s backwards looking maps. New York’s resilience program has benefitted from federal support, including funding from a Community Development Block Grant for Disaster Recovery issued by HUD.²¹⁴ NYC also has availed itself of support

²⁰⁶ Observatory of Pub. Sector Innovation, Org. for Econ. Co-operation & Dev., *Rebuild by Design*, <https://www.oecd.org/governance/observatory-public-sector-innovation/innovations/page/rebuildbydesign.htm> (last visited July 16, 2016).

²⁰⁷ *Id.*

²⁰⁸ 100 Resilient Cities, *About Us*, <http://www.100resilientcities.org/about-us/> (last visited July 16, 2016).

²⁰⁹ *Id.*

²¹⁰ See CITY OF N.Y., PLANYC PROGRESS REPORT 2014, at 55 (2014), available at http://www.nyc.gov/html/planyc2030/downloads/pdf/140422_PlaNYCP-Report_FINAL_Web.pdf (discussing the accomplishments and failures of the initiatives undertaken by PlaNYC).

²¹¹ Press Release, City of N.Y., Mayor Bloomberg Announces New Measures to Allow Home and Property Owners Rebuilding After Hurricane Sandy to Meet Updated Flood Standards (Jan. 31, 2013), <http://www1.nyc.gov/office-of-the-mayor/news/044-13/mayor-bloomberg-new-measures-allow-home-property-owners-rebuilding-after-hurricane> (last visited July 16, 2016).

²¹² N.Y.C. Council Res. No. 1984-2013 (Oct. 9, 2013) (approving the decision of the City Planning Commission on Application No. N 130331 (A) ZRY, pertaining to enabling flood resilient construction within flood zones), available at <http://legistar.council.nyc.gov/ViewReport.aspx?M=R&N=Text&GID=61&ID=1477906&GUID=CDE9C427-599D-43C3-9DF6-6A720D3094CB&Title=Legislation+Text>. It also introduces regulations to mitigate potential negative effects of flood-resistant construction on the streetscape and public realm. See *id.* § 64-00.

²¹³ CITY OF N.Y., *supra* note 157, at 50.

²¹⁴ *Id.* at 402.

through FEMA's Hazard Mitigation Grant Program.²¹⁵ Notably, both of these funding sources are made available only after disaster strikes.²¹⁶ Still, critics of PlaNYC argue that it does not go far enough in moving citizens out of harm's way.²¹⁷

Miami-Dade County, which is on every map of adverse impacts from sea level rise, initiated a process to integrate potential climate change impacts into its local planning.²¹⁸ The process first considered how hazards and climate change would impact issues relating to stormwater management and runoff, infrastructure maintenance and placement, and other planning efforts.²¹⁹ Miami-Dade County produced "GreenPrint" in December 2010.²²⁰ GreenPrint recognizes the importance of studying regional and local climate change trends and impacts.²²¹ It emphasizes the need to "integrate future climate change impacts into community and government decision-making for capital, operational, and land-use issues."²²²

In 2012, Miami-Dade County went farther and prepared the Southeast Florida Regional Climate Adaptation Plan (RCAP), in cooperation with Broward, Palm Beach, and Monroe Counties.²²³ The RCAP sets forth a strategy for adapting to climate change by studying and monitoring changes to the environment and community, and developing plans that factor in climate change including sea level rise.²²⁴ The RCAP expects the participating communities to develop new flood maps that factor in sea level rise and storm surge modeling.²²⁵ It also promotes the integration of climate change data into its hazards emergency planning.²²⁶

Progressive efforts by local governments stem from necessity to protect their citizens in the face of increased flood damage. These governments simply could not afford to wait for direction from federal governments. Not only do the local governments have the need to act now, but they also have the ability to understand the local conditions and the tools to undertake these efforts.

²¹⁵ *Id.* at 403–04.

²¹⁶ *Id.* at 402–04.

²¹⁷ Andrew C. Revkin, Opinion, *Can Cities Adjust to a Retreating Coastline?*, N.Y. TIMES: DOT EARTH, (Aug. 22, 2013, 1:37 PM) <http://dotearth.blogs.nytimes.com/2013/08/22/can-cities-adjust-to-a-retreating-coastline/> (querying whether the New York City plan is "a good one or a stopgap that fits political imperatives of the moment while building bigger risks in the long haul?").

²¹⁸ City of Miami Beach, *Climate Change & Sea Level Rise*, <http://www.miamibeachfl.gov/green/default.aspx?id=74553> (last visited July 16, 2016).

²¹⁹ FEMA INTEGRATING HAZARD MITIGATION INTO LOCAL PLANNING, *supra* note 43, at 5-2.

²²⁰ MIAMI-DADE CTY., GREENPRINT: OUR DESIGN FOR A SUSTAINABLE FUTURE, (2010), *available at* <http://www.miamidade.gov/greenprint/pdf/plan.pdf>.

²²¹ *Id.* at 76–77.

²²² *Id.* at 76.

²²³ SE. FLA. REG'L CLIMATE CHANGE COMPACT CTYS., A REGION RESPONDS TO A CHANGING CLIMATE: REGIONAL CLIMATE ACTION PLAN, at v (2012), *available at* <http://www.southeastfloridacclimatecompact.org/wp-content/uploads/2014/09/regional-climate-action-plan-final-ada-compliant.pdf>.

²²⁴ *Id.* at 13–14.

²²⁵ *Id.* at 17.

²²⁶ *Id.* at 39–41.

*B. Adaptation Tools and Obstacles**1. Local Power to Limit Floodplain Development*

Local communities have sufficient tools to discourage moral hazard behavior and promote climate-sensitive flood management.²²⁷ Tools include: 1) state-mandated coastal planning; 2) rolling set-backs, especially those based on expected erosion rates; 3) the prevention of private armoring; 4) the purchase or condemnation of high at-risk properties, especially repeat offenders; 5) rebuilding requirements that minimize future storm or flood damage; and 6) the use of Transferrable Development Rights to compensate land owners forbidden to rebuild in high-risk areas.²²⁸

The effectiveness of local regulation ultimately depends on states' and local governments' political will to face climate change, potential property rights' or other legal challenges, and risk-shifting between communities.²²⁹ Disparity between communities will be great considering that politicians at all levels are not only denying climate change, but also are refusing to acknowledge sea level rise. For instance, in 2012, North Carolina's legislature considered a widely ridiculed bill to ban all local and state entities, other than the state Coastal Commission, from determining the rate of projected sea level rise; it also required the Commission to limit its review to historic data.²³⁰ In 2012, a less extreme version, but one that still limits consideration of sea level rise, became law without the governor's signature.²³¹

2. State Response to Local Limits on Floodplain Development

Flood control regulation that prohibits or severely limits floodplain development may trigger potential property owner claims of unfair discriminatory or unanticipated regulation. In general, no legal basis for such claims exists.²³² The regulation of floodplain development is fair

²²⁷ The following paragraph draws on the comprehensive survey of the tools and their use by the Columbia Law School Center for Climate Change. ANNE SIDERS, *MANAGED COASTAL RETREAT: A LEGAL HANDBOOK ON SHIFTING DEVELOPMENT AWAY FROM VULNERABLE AREAS* 5–7 (2013), available at https://web.law.columbia.edu/sites/default/files/microsites/climate-change/files/Publications/Fellows/ManagedCoastalRetreat_FINAL_Oct%2030.pdf.

²²⁸ *Id.* at ii–vi; see Nicholas R. Williams, *Coastal TDRs and Takings in a Changing Climate*, 46 *URB. LAW.* 139, 149–58 (2014) (discussing Transferrable Development Rights).

²²⁹ See Chizewer & Tarlock, *supra* note 12, at 1785 (discussing risks to a projects political viability).

²³⁰ Jane J. Lee, *Legislating Sea Level Rise*, *SCIENCE*, June 12, 2012, <http://www.sciencemag.org/news/2012/06/legislating-sea-level-rise> (last visited July 16, 2016).

²³¹ Act of July 3, 2012, S.L. 2012-202, 2012 N.C. Sess. Laws. 984.

²³² See, e.g., *Gove v. Zoning Bd. of Appeals*, 831 N.E.2d 865, 871 n.13 (Mass. 2005) (denial of building permit in state coastal conservancy district because, *inter alia*, a severe storm could detach the proposed house from its foundation); *Bonnie Briar Syndicate, Inc. v. Town of Mamaroneck*, 721 N.E.2d 971, 976 (N.Y. 1999) (rezoning of 150-acre golf course property important for flood storage from residential to solely recreational use is not a taking of private property).

because, when a property owner voluntarily exposes himself to risk, he lowers his expectation of compensation. As we have argued, much building in floodplains, at least today, can be characterized as moral hazard behavior, which should be discouraged, not encouraged.²³³ Society and individuals who put themselves at risk ultimately benefit from rules that discourage moral hazard development.

Voluntary assumption of risk underlies the well established restrictions on the right to rebuild structures damaged by a flood.²³⁴ Existing structures in a floodplain that do not conform to present zoning standards can receive protection as non-conforming uses.²³⁵ But, if a property is destroyed by an Act of God, such as flood or hurricane, and a substantial percentage of its fair value is destroyed, most zoning ordinances only allow its rebuilding as a conforming use. This approach prevents property owners who live in high-risk areas from rebuilding in a way that exposes them to the same risk that damaged their property. As early as 1951, the Supreme Court of Mississippi held that the owner of a non conforming beachfront restaurant, which was completely blown away by a hurricane, could not rebuild.²³⁶ The court's reasoning leaves much to be desired,²³⁷ but the result remains good law today.²³⁸ State law, however, may constrict municipal options by encouraging inappropriate rebuilding.²³⁹

²³³ Allison Dunham, *Flood Control via The Police Power*, 107 U. PA. L. REV. 1098, 1103–117 (1959), remains the classic synthesis of Gilbert's White's critique of flood control policy with police power rationales for restricting development in floodplains.

²³⁴ See *Sansotta v. Town of Nags Head*, 724 F.3d 533, 537–38, 541 (4th Cir. 2013).

²³⁵ See, e.g., *Pappas v. Zoning Bd. of Adjustment of Phila.*, 589 A.2d 675, 676 (Pa. 1991) (quotation marks omitted) (“As a matter of Pennsylvania zoning law, the owner of property to which a lawful nonconforming use has attached enjoys a vested property right.”).

²³⁶ *Palazzola v. City of Gulf Port*, 52 So.2d 611, 613–14 (Miss. 1951).

²³⁷ The court basically relied on *Village of Euclid v. Ambler Realty Co.*, 272 U.S. 365 (1924), for the proposition that general ordinances are a proper exercise of the police power, although they also concluded, with no analysis, that the city's ordinance was not an “unreasonable exercise.” *Palazzola*, 52 So.2d at 613.

²³⁸ E.g., *Sams v. Dep't of Env'tl. Prot.*, 63 A.3d 953, 985–86 (Conn. 2013); *Motley v. Borough of Seaside Park Zoning Bd. of Adjustment*, 62 A.3d 908, 915 (N.J. Super. Ct. App. Div. 2013); *Ortell v. City of Nowthen*, 814 N.W.2d 40, 43 (Minn. Ct. App. 2012).

²³⁹ See, e.g., VA. CODE ANN. § 15.2-2307 (2016)

A zoning ordinance shall permit the owner of any residential or commercial building damaged or destroyed by a natural disaster or other act of God to repair, rebuild, or replace such building to eliminate or reduce the nonconforming features to the extent possible, without the need to obtain a variance as provided in § 15.2-2310. If such building is damaged greater than 50 percent and cannot be repaired, rebuilt or replaced except to restore it to its original nonconforming condition, the owner shall have the right to do so. The owner shall apply for a building permit and any work done to repair, rebuild or replace such building shall be in compliance with the provisions of the Uniform Statewide Building Code (§ 36-97 et seq.) and any work done to repair, rebuild or replace such building shall be in compliance with the provisions of the local floodplain regulations adopted as a condition of participation in the National Flood Insurance Program. Unless such building is repaired, rebuilt or replaced within two years of the date of the natural disaster or other act of God, such building shall only be repaired, rebuilt or replaced in accordance with the provisions of the zoning ordinance of the locality. However, if the nonconforming building is in an area under a federal

Many states have accepted the legitimacy of controlling floodplain development, and now are struggling to incorporate climate change risk into local land-use planning and regulation.²⁴⁰ Most state courts have effectively incorporated risk and moral hazard into land-use regulatory decisions designed to limit floodplain development.²⁴¹ The Supreme Court, however, has not.

3. The Supreme Court Takings Jurisprudence's Influence on Floodplain Regulation

The disconnect between the states' and the Supreme Court's takings jurisprudence creates a problem. The Supreme Court's takings cases involve floodplain management, but pay insufficient attention to the 1) rationale for floodplain regulation, and 2) the question of whether a known assumption of a risk is a legitimate investment-backed expectation. Instead, the Supreme Court's takings jurisprudence focuses almost exclusively on the regulation's impact on the property owner.

disaster declaration and the building has been damaged or destroyed as a direct result of conditions that gave rise to the declaration, then the zoning ordinance shall provide for an additional two years for the building to be repaired, rebuilt or replaced as otherwise provided in this paragraph. For purposes of this section, "act of God" shall include any natural disaster or phenomena including a hurricane, tornado, storm, flood, high water, wind-driven water, tidal wave, earthquake or fire caused by lightning or wildfire. For purposes of this section, owners of property damaged by an accidental fire have the same rights to rebuild such property as if it were damaged by an act of God. Nothing herein shall be construed to enable the property owner to commit an arson under § 18.2-77 or 18.2-80, and obtain vested rights under this section. *Id.*

²⁴⁰ Recent administrative and legislative efforts include California and Florida. Supported by U.S. Geological Survey sea level rise maps, California has created comprehensive guidelines for sea level rise adaptive planning. CAL. COASTAL COMM'N, SEA LEVEL RISE POLICY GUIDANCE: INTERPRETIVE GUIDELINES FOR ADDRESSING SEA LEVEL RISE IN LOCAL COASTAL PROGRAMS AND COASTAL DEVELOPMENT PERMITS (2015), *available at* http://documents.coastal.ca.gov/assets/slr/guidance/August2015/0_Full_Adopted_Sea_Level_Rise_Policy_Guidance.pdf. Florida authorizes local governments to designate areas vulnerable to coastal flooding as "adaptation action areas." Florida Community Planning Act, Fla. Stat. Ann. § 163.3164 (West 2016). Toronto, Ontario, has adopted a plan to increase the capacity of the city to absorb extreme rain events. City of Toronto, *Climate Change Adaptation: Towards a Resilient City*, <http://www1.toronto.ca/wps/portal/contentonly?vgnextoid=78cfa84c9f6e1410VgnVCM10000071d60f89RCRD> (last visited July 16, 2016).

²⁴¹ In addition to upholding zoning ordinances, other rationales can deter moral hazard behavior. These include abandonment of the use, *Chiaraluce v. Ferreira*, Nos. 11 MISC 451014(GHP), 2014 WL 7466508 * 8 (Mass. Land Ct. Dec. 31, 2014), and public nuisance law, *Sansotta*, 724 F.3d 533, 541 (4th Cir. 2013). In *Sansotta*, after beach erosion caused six cottages to shift seaward to the line of vegetation and a coastal storm left them stranded on a public beach, the town ordered the cottages to be torn down as public nuisances. *Id.* at 537. Nonetheless, the owners continued to repair them. *Id.* The court brushed aside a due process challenge to the order and subsequent assessment of fines for violating it because these types of regulatory actions "represent limitations on the use of property that inhere in the title itself, in the restrictions that background principles of the State's law of property and nuisance already place upon land ownership." *Id.* at 541.

The Fifth Amendment's prohibition against taking property without due process applies to flood-related land-use controls in two situations: discrimination and surprise.²⁴² First, the Fifth Amendment justifiably protects individual property owners from discrimination.²⁴³ Discrimination occurs when a single property owner (or a small group) is singled out to bear a disproportionate public burden.²⁴⁴ For example, it may be efficient to purchase easements on high-risk properties that prevent rebuilding after a flood or to condemn particularly vulnerable properties. Fairness demands that the government compensate property owners for agreeing to dedicate their land to a flood control strategy that produces benefits for a large area.²⁴⁵

Second, governments should compensate a landowner when she has suffered substantial and unanticipated losses in property value.²⁴⁶ The Court incorporated the protection against surprise into takings law in its 1978 decision in *Penn Central Transportation Co. v. City of New York (Penn Central)*.²⁴⁷ *Penn Central* upheld the landmark designation of Grand Central Station under a three-part balancing test, which implicitly narrowed the situations in which property owners could claim surprise by limiting compensation to cases where the government interferes with "distinct investment-backed expectations."²⁴⁸

Unfortunately, the Court's erratic and inconsistent post-*Penn Central* takings jurisprudence incentivizes property owners' moral hazard behavior.²⁴⁹ Behavior that exposes the landowner, and those in the

²⁴² Frank I. Michelman, *Property, Utility, and Fairness: Comments on the Ethical Foundations of "Just Compensation" Law*, 80 HARV. L. REV. 1165, 1232 (1967).

²⁴³ *Armstrong v. United States*, 364 U.S. 40, 49 (1960).

²⁴⁴ *Id.* (describing the purpose of the Fifth Amendment to include preventing government from forcing individuals to bear public burdens alone); see also Jed Rubenfeld, *Usings*, 102 YALE L.J. 1077 (1993) (describing this principle in terms of protecting individual liberty).

²⁴⁵ Becky Hayat and Robert Moore, *Addressing Affordability and Long-Term Resiliency Through the National Flood Insurance Program*, 45 ENVTL. L. REP. 10338, 10347–48 (2015). The use of eminent domain to control floods can be controversial. In 2015, the Corps proposed a \$1.9 billion plan to reduce hurricane flooding in high risk areas in Louisiana. Mark Schleifstein, *Officials Object to Corps use of Eminent Domain in Hurricane Plan*, TIMES-PICAYUNE, June 17, 2015, http://www.nola.com/environment/index.ssf/2015/06/state_local_governments_object.html (last visited July 16, 2016). Instead of building higher levees, the Corps proposed removing up to 4,000 structures and included the use of eminent domain in areas that recently experienced damage. *Id.* In response, the state legislature passed a law prohibiting state participation in the project if more than 25% of the structures in the project were expropriated. *Id.*

²⁴⁶ See, e.g., *Avenida San Juan P'ship v. City of San Clemente*, 135 Cal. Rptr. 3d 570, 582 (Cal. Ct. App. 2011) (upholding lower court's finding insufficient notice for re-zoning as constituting a taking). Surprise cases often have a strong hint of irrationality. For example, the court found that a sudden severe down zoning was spot zoning and the open space justifications pretextual and probably designed only to benefit neighboring properties. *Id.* at 583. See also Michelman, *supra* note 241, at 1169–71 (discussing inequity in takings compensation jurisprudence); Joseph L. Sax, *Land Use Regulation: Time to Think About Fairness*, 50 NAT. RESOURCES J. 455, 458–60 (2010) (same).

²⁴⁷ 438 U.S. 104, 124 (1978).

²⁴⁸ *Id.*

²⁴⁹ There is an extensive debate in academia on the merits of this argument. See, e.g., Holly Doremus, *Takings and Transitions*, 19 J. LAND USE & ENVTL. L. 1, 3 (2003) (discussing the Court's

surrounding area, to the predictable risk of serious damage inherent in the location does not trigger the fairness rationales for compensation.²⁵⁰ The unfair surprises component of takings law should only compensate victims of regulation who have suffered disproportionate, substantial, and unanticipated losses in the value of their property.

Three major post-*Penn Central* decisions involve flood control regulations, and the Supreme Court found a potential taking in each.²⁵¹ First, in *First English Evangelical Lutheran Church of Glendale v. Los Angeles County*²⁵² the court held that a church camp could claim a temporary taking after the camp was destroyed in a flash flood and Los Angeles County prevented it from rebuilding.²⁵³ The case established, for the first time, that a court may award damages for a temporary taking.²⁵⁴ The decision to locate the camp in a floodplain was a self-created risk, but neither the majority opinion nor Justice Stevens's dissent discussed the desirability of preventing the landowner from engaging in a moral hazard. However, the Church's victory was short-lived. On remand, an intermediate California appellate court held that that Church had suffered no damage under *Penn Central* balancing test because the property owner did not suffer a total loss of value and floodplain regulation is a public safety exception to a taking.²⁵⁵

*Lucas v. South Carolina Coastal Council*²⁵⁶ is the Court's most regulation-chilling decision. The Court held that a state setback regulation on a barrier island, designed to prevent houses from crashing into each other in a hurricane, was a per se taking because it deprived the landowner of all economic value of his land.²⁵⁷ The denial of development permission, after all the neighboring properties had been developed, was invidious discrimination, because the regulation came too late.²⁵⁸

failure to address head-on the landowners attempt to alter the land in regulatory takings); Saul Levmore, *Changes, Anticipations, & Reparations*, 99 COLUM. L. REV. 1657 *passim* (1999) (arguing in favor of denying compensation resulting from regulatory change as incentivizing societally useful behavior in anticipation of change); Lawrence Blume & Daniel L. Rubinfeld, *Compensation for Takings: An Economic Analysis*, 72 CALIF. L. REV. 569, 571–573 (1984) (discussing the economics of considering compensation as insurance against regulatory risks).

²⁵⁰ See Dunham, *supra* note 232, at 1123–24 (discussing Due Process concerns). See also Robin Kundis Craig, *Of Sea Level Rise and Superstorms: The Public Health Police Power As a Means of Defending Against "Takings" Challenges to Coastal Regulation*, 22 N.Y.U. ENVTL. L.J. 84, 93–94 (2014) (noting that the imminent and substantial threats hurricanes pose to public health and safety give rise to the public necessity defense, justifying a taking without compensation); Cindy L. Parker, *Health Impacts of Sea-Level Rise*, 66 PLAN. & ENVTL. L., May 2014, at 8 *passim* (2014) (discussing sea level rise impacts to health); John D. Echeverria, Koontz: *The Very Worst Takings Decision Ever?*, 22 N.Y.U. ENVTL. L.J. 1 (2014) (discussing Koontz case).

²⁵¹ This section mirrors the discussion in Tarlock, *supra* note 66, at 178–80.

²⁵² 482 U.S. 304 (1987).

²⁵³ *Id.* at 307, 322.

²⁵⁴ *Id.* at 307.

²⁵⁵ *First English Evangelical Lutheran Church of Glendale v. County of Los Angeles*, 258 Cal. Rptr. 893, 907 (Cal. Ct. App. 1989).

²⁵⁶ 505 U.S. 1003 (1992).

²⁵⁷ *Id.* at 1008–09, 1019.

²⁵⁸ *Id.* at 1030–31.

South Carolina nonetheless argued that it acted well within its police powers, because the setbacks aimed to prevent a landowner from engaging in a harmful use, as opposed to unjustifiably and unfairly forcing him to confer a benefit on the community.²⁵⁹ The distinction has been urged as a useful test to decide when fairness demands compensation, but it was abused by Justice Brennan in *Penn Central*,²⁶⁰ and Justice Scalia dismissed the distinction on the ground that it was incoherent.²⁶¹ According to Justice Scalia, a regulation that denies a landowner any valuable development option could only be justified if there was an inherent limitation on the landowner's title—and none was found in the case.²⁶² The test is dead for all practical purposes. Justice Brennan justified the distinction by suggesting that the destruction of the landmarked terminal was “harmful.”²⁶³ For all its questionable analysis, the much-parsed *Lucas* is a simple equal protection case. Lucas's lot was the last undeveloped lot along the beach.²⁶⁴ The state applied a setback to a barrier island after development on all but plaintiff's lots had occurred.²⁶⁵

In a third Supreme Court case, which ignored the merits of flood damage prevention, a city conditioned its building permit approval on the landowner's dedication of a portion of her property for improved storm drainage.²⁶⁶ This type of development exaction typically purports to offset the external costs of a specific proposed development; the Supreme Court requires an “essential nexus” between the impact of the development and the exaction, and “rough proportionality” between the exaction and the predicted consequence.²⁶⁷ The Court readily found a nexus between preventing flood damage and limiting additional development, but it imposed a very high burden on the city to justify the exaction: “The city has never said why a public greenway, as opposed to a private one, was required in the interest of flood control.”²⁶⁸ Even after these three Supreme Court cases, courts will still likely uphold floodplain regulations, but cities and property owners will still consider takings challenges to regulations.

Flood regulation may also be chilled because the Supreme Court has been reluctant to consider legislation discouraging moral hazard behavior as adequate notice to landowners that compensation will be denied or limited. *Palazzolo v. Rhode Island*²⁶⁹ virtually foreclosed legislative notice, but left a door open to this approach. Rhode Island defended the refusal to fill a wetland on the basis that forty years of wetland regulation put landowners

²⁵⁹ *Id.* at 1022–23.

²⁶⁰ *Penn Central*, 438 U.S. 104, 136–137 (1978).

²⁶¹ *Lucas*, 505 U.S. at 1026.

²⁶² *Id.* at 1027.

²⁶³ *Penn Central*, 438 U.S. at 133 n.30.

²⁶⁴ *Lucas*, 505 U.S. at 1008.

²⁶⁵ *Id.* at 1008–09.

²⁶⁶ *Dolan v. City of Tigard*, 512 U.S. 374, 377, 379–80 (1994).

²⁶⁷ *Id.* at 386.

²⁶⁸ *Id.* at 393.

²⁶⁹ 533 U.S. 606 (2001).

on notice that it would be difficult to obtain such permission.²⁷⁰ The Court dismissed the argument that the purchaser of highly regulated property assumes the risk of development denial with the quip that “[t]he state may not put so potent a Hobbesian stick into the Lockean bundle.”²⁷¹ Locke himself might be surprised that his labor theory now incorporates the Roman law right of *ius abutendi*, the right to destroy property.²⁷² However, Justice O’Connor’s increasingly influential concurrence opened the door to the incorporation of moral hazard into takings law.²⁷³ She posited that the level of regulation was relevant to the property owner’s reasonable investment-backed expectations, and thus the level of reasonable compensation.²⁷⁴ Much like the California state court in *First English Evangelical Lutheran Church of Glendale*,²⁷⁵ the Rhode Island trial court did a better job than the Supreme Court of analyzing the moral hazard issue and held that the proposed development would be a public nuisance.²⁷⁶

Finally, in 2013, the Supreme Court took another major step away from the incorporation of moral hazard into takings jurisprudence in a case with widespread significance for floodplain regulation. *Koontz v. St. Johns River Water Management District*²⁷⁷ rewards behavior that increases the risk of flood damage. Koontz owned a 14.9-acre wetland, a potential floodwater retention area, and applied for a permit to develop 3.7 acres.²⁷⁸ He offered to transfer a conservation easement to the District on the remaining acres.²⁷⁹ As a first counter offer, the District proposed a permit to develop one acre in return for a conservation easement on the remaining 13.9 acres or a permit to develop the 3.7 acres in return for a conservation easement on the remaining acreage *and* a payment to improve nearby wetlands owned by the District.²⁸⁰

²⁷⁰ *Id.* at 614–15.

²⁷¹ *Id.* at 627.

²⁷² See Lior Jacob Strahilevitz, *The Right to Destroy*, 114 YALE L.J. 781, 787–89 (2005) (defining *ius abutendi*).

²⁷³ *Palazzolo*, 533 U.S. at 634–635 (O’Connor, J., concurring). Recently, the Supreme Court of South Carolina followed Justice O’Connor’s analysis in *Palazzolo*. *Columbia Venture, LLC v. Richland County*, 776 S.E.2d 900, 914 (S.C. 2015) (finding that the purchasers of 4,461 acres in floodplain undergoing FEMA map revision did not have an “objectively reasonable” investment-backed expectation).

²⁷⁴ *Palazzolo*, 533 U.S. at 634–635.

²⁷⁵ 258 Cal. Rptr. 893, 907 (Cal. Ct. App. 1989).

²⁷⁶ *Palazzolo v. Rhode Island*, No. WM 88-0297, 2005 WL 1645974, at *5 (R.I. Super. Ct. July 5, 2005).

²⁷⁷ 133 S. Ct. 2586 (2013). The critical literature is already substantial. See generally Echeverria, *supra* note 249 (discussing *Koontz* at length); Sean F. Nolon, *Bargaining for Development Post-Koontz: How the Supreme Court Invaded Local Government*, 67 FLA. L. REV. 171 (2015) (same); Julie A. Tappendorf & Matthew T. DiCianni, *The Big Chill? - The Likely Impact of Koontz on the Local Government/Developer Relationship*, 30 TOURO L. REV. 455, 467–73 (2014) (same).

²⁷⁸ *Koontz*, 133 S. Ct. at 2591–92.

²⁷⁹ *Id.* at 2592–93.

²⁸⁰ *Id.* at 2593.

Koontz immediately sued under Florida's taking law.²⁸¹ In a 5-4 decision, the United States Supreme Court reversed the Florida Supreme Court and held that the proposed condition was a taking.²⁸² To do this, the majority: 1) extended strict scrutiny of exactions from the dedication of land to monetary payments,²⁸³ 2) extended the unconstitutional conditions doctrine to a situation where a landowner might be coerced "into voluntarily giving up property for which the Fifth Amendment would otherwise provide just compensation,"²⁸⁴ and 3) unduly discouraged local government-land owner negotiations with its almost de facto presumption that much local government regulation is extortion.²⁸⁵ The Court characterized the District's counteroffer as "an unconstitutionally extortionate demand."²⁸⁶

The decision's bite may be more limited. The majority did not decide whether the decision applies only to individualized negotiations or whether it applies to general, legislative exactions. Even if the Court chooses not to extend the rationale to general, legislative standards, it adversely impacts local land-use regulation of sensitive areas in two ways. First, it creates a disincentive to engage in negotiation.²⁸⁷ Second, it encourages cities to deny

²⁸¹ FLA. STAT. ANN. § 373.617(2) (West 2010).

²⁸² *Koontz*, 133 S. Ct. at 2603.

²⁸³ *Id.* at 2601. *Koontz* is hard, if not impossible, to reconcile with the decision in *Eastern Enterprises v. Apfel*, 524 U.S. 498 (1998), where five members of the Court, including Justice Kennedy, who voted in the majority in *Koontz*, agreed that the government imposed financial obligations could not be a Fifth Amendment taking because no identified property interest is impacted. *Id.* at 540 (Kennedy, J., concurring). The majority in *Koontz* unjustifiably rejected Justice Kagan's dissenting opinion, which correctly tagged the majority for refusing to reconcile adequately its conclusion. *Koontz*, 133 S. Ct. at 2603-04; see also Echeverria, *supra* note 249, at 2-3 (criticizing the Court's failure to explain or justify its ruling in light of pre-existing law).

²⁸⁴ *Koontz*, 133 S. Ct. at 2594. The unconstitutional conditions doctrine does not create new liberties, but only protects those created from instances where the government burdens them with insufficient justification. Kathleen M. Sullivan, *Unconstitutional Conditions*, 102 HARV. L. REV. 1413, 1415, 1419, 1425 (1989) (stating that the unconstitutional conditions doctrine holds only that the government cannot condition an existing benefit on the surrender of a constitutional right). Thus, the Court seems to have created a "penumbral" and unnecessary takings right because: 1) if there is an exaction, *Nollan-Dolan* require a high justification; 2) if there was a taking, the standard should be the *Penn Central* balancing test; and 3) if the decision was arbitrary, substantive due process applies.

²⁸⁵ *Koontz*, 133 S. Ct. 2586, 2595-96.

²⁸⁶ *Id.* at 2597. The Court did not mention that *Koontz* had already received a return almost 15 times his original investment and potentially raised the return to 18 times. *Koontz* purchased the 14.9-acre parcel for \$95,000.00 in 1972, and in 1987 received \$402,000.00 when 0.7 of an acre was condemned for a highway. Before, the Florida Supreme Court decision, the District gave him the permit and *Koontz* sold the property to a development company—which never developed it—for \$1,200,000.00. Thus, the case is about \$376,000.00 temporary takings award. *St. Johns River Water Mgmt. Dist. v. Koontz*, 5 So. 3d 8, 9, 17 (Fla. Dist. Ct. App. 2009), *vacated*, 77 So. 3d 1220 (Fla. 2011), *rev'd*, 133 S. Ct. 2586 (2013).

²⁸⁷ *Koontz* makes it significantly easier for developers to drop out of negotiations and sue the local government over the allegedly "extortionate" demands that it has made during the permitting process. *Koontz* itself demonstrates all too clearly how this could happen. *Koontz*, upset with the District's rejection of his development proposal, broke off his negotiations with it and filed suit. The dissent points out that *Koontz* was in the early stages of the negotiation process and that it is unclear whether the "extortionate demands" made by the District were in fact demands or merely nonbinding proposals. In fact, the Court's refusal to provide standards

a permit, a practice that the Court approved. But, this exposes them to a takings suit that could have been avoided if the local government and the developer had negotiated a floodplain development plan that minimized the risk of flood damage.

Supreme Court takings jurisprudence has a substantial, potential chilling effect on local floodplain regulation. First, it does not distinguish between rational resource management programs and regulations that seem to target an individual or small group of property owners without any broader resource management justification. The Court has come close to erecting a presumption that all local natural resource regulation is unjustified overreaching. Second, the jurisprudence does not give sufficient, if any, weight to whether the regulated landowner has engaged in moral hazard behavior and unjustifiably shifted the risk of damage to its neighbors. Third, the Court has failed to recognize that landowners should be expected to make decisions based on increased knowledge about the risks of their actions. FEMA's flood mapping upgrades and the growing dissemination of the scientific consensus about the increased flood risks of global climate change make it even more appropriate to curb moral hazard behavior.

C. Federal Climate Reforms Can Boost Local Government Resilience Efforts

The Obama Administration's climate resilience reforms potentially support local governments' flood management efforts. Federal laws should set minimum standards for state and local land-use regulations through: 1) incentives and funding of state and local projects, 2) required planning, and 3) construction of facilities that impact adjacent land-use.²⁸⁸ The federal government can provide local governments with improved information, implementation funds, and coordinating structures.²⁸⁹ Local governments will benefit from access to better regional assessments of climate change impacts. NOAA's continued development of this data will prove very helpful, as will the Climate Data Initiative. But better coordination and distribution of this information is needed.²⁹⁰

to distinguish between the two is a serious obstacle to collaboration between a local government and a developer. Tappendorf & DiCianni, *supra* note 276, at 471 (footnotes omitted).

²⁸⁸ See Patricia E. Salkin, *The Quiet Revolution and Federalism: Into the Future*, 45 J. MARSHALL L. REV. 253, 255 n.7 (2012) (quoting FRED P. BOSSELMAN, DUANE FEUER & TOBIN M. RICHTER, *FEDERAL LAND USE REGULATION* 1–2 (1977)).

²⁸⁹ Alice Kaswan, *Climate Adaptation and Land Use Governance: The Vertical Axis*, 39 COLUM. J. ENVTL. L. 390, 398 (2014).

²⁹⁰ As the GAO has noted:

[T]he federal government plays a critical role in producing the information needed to facilitate more informed local adaptation decisions. However, this information exists in an uncoordinated confederation of networks and is not easily accessible, so state and local officials may make decisions without it or choose not to act at all. These decision makers often struggle to identify which information among the vast number of available datasets and studies is relevant. In April 2013, we recommended that a federal entity designated by the Executive Office of the President work with agencies to identify for

While federal funding remains tight, future administrations should continue to prioritize the climate resilience efforts to support the Climate Action Plan. Public-private partnerships may offer some funding opportunities for innovative and forward looking flood planning.

Federal structure, guidance, and requirements can push the local governments to advance their flood protection management. The proposed federal flood management standard relates only to federal agencies.²⁹¹ Some local floodplain ordinances already contain a similar standard.²⁹² The next step is to require all at-risk local governments to raise their flood management standard.

Agencies that provide grants to local and state governments can begin to build in more forward looking requirements that will help local governments prepare for climate change. NOAA has already begun to provide structure for states around planning for coastal hazards associated with climate change.²⁹³ Community Development Block Grants (CDBG) provide another opportunity to add requirements to promote climate resilience.²⁹⁴ Increased state and local involvement in the FIRM mapping program could provide a better understanding of local conditions and any on-the-ground changes—e.g., new development impacts the stability.²⁹⁵ The NFIP's Community Rating System also can be promoted more aggressively to encourage more participation and ultimately smarter local flood management.²⁹⁶

Although local governments have taken positive steps toward improved flood management and hold the authority to take more steps, they will not achieve consistent results without federal and state financial and legislative support. Local governments necessarily depend on a stable Supreme Court jurisprudence that values regulations that keep property owners out of harm's way.

local infrastructure decision makes the best available climate-related information for planning and to update this information over time.

GAO-15-290, *supra* note 1, at 82–83 (2015) (footnote omitted).

²⁹¹ See Establishing a Federal Flood Risk Management Standard and a Process for Further Soliciting and Considering Stakeholder Input, Exec. Order No. 13,690, 80 Fed. Reg. 2,645 (Feb 4, 2015) (limiting floodplain management action to executive departments and agencies).

²⁹² See, e.g., LADUE, MO., ORDINANCE 2,103 (Dec. 15, 2014) (repealing prior flood management standards and setting forth new standards in accordance with federal standards).

²⁹³ NAT'L OCEANIC & ATMOSPHERIC ADMIN., *supra* note 126, at 1.

²⁹⁴ U.S. DEP'T OF HOUS. & URBAN DEV., CDBG NATIONAL DISASTER RESILIENCE GRANTS (2015), available at <https://www.hudexchange.info/onecpd/assets/File/CDBG-NDR-Grant-Introduction.pdf>.

²⁹⁵ For instance, North Carolina became a Cooperating Technical State with FEMA after Hurricane Floyd made clear the need for updated and more accurate maps. NAT'L RESEARCH COUNCIL OF THE NAT'L ACADS, LEVEES AND THE NATIONAL FLOOD INSURANCE PROGRAM: IMPROVING POLICIES AND PRACTICE 52 (2013). North Carolina provided the LIDAR technology to update the maps. *Id.*

²⁹⁶ See *supra* notes 80–83, 116–19.

VI. CONCLUSION

Longstanding governance norms favor local land-use control,²⁹⁷ and support local governments as the appropriate lead in flood management.²⁹⁸ Cities such as New York City and Miami, among several others, have demonstrated that careful study of local conditions can lead to innovative approaches to integrating land-use and hazardous mitigation planning. State courts have respected these efforts by carefully analyzing the purpose of local regulations in context when evaluating takings claims.

Local governments should not take on full responsibility for flood management, though. Lack of political will across states and localities, perceived risks that stem from takings jurisprudence, and financial difficulties all impose obstacles. Federal involvement in flood management can prevent disparity between states and provide an integrated structure that works across states lines.

The Obama Administration's climate resilience reforms can move federal flood management toward an integrated and risk-based approach based on climate science. They promote innovation and planning based on advanced climate data. The reforms call for local planning that considers hazard mitigation.

The reforms as they stand are not enough. A Supreme Court takings jurisprudence that reflects the risks posed by global climate change will be crucial to implement the flood risk minimization policies adopted by the Obama administration. The strength of a climate change-based federal policy dissipates quickly if the federal government cannot ensure that local governments adopt effective policies to complement federal policy. This is especially important now when the federal government lacks a coherent flood protection legislative framework.

The reforms are also fragile because they are based in executive orders, which can be readily changed by the next administration. They also cover federal agency action rather than address state and local action. However, if the federal agencies implement the executive orders effectively, they can influence positively state and local behavior.

Promising developments at the local and federal level offer an opportunity to improve flood management in the United States. These developments must pave the way for larger scale reforms that require integrated flood management across the nation.

²⁹⁷ Kaswan, *supra* note 288, at 394 (citing Robert L. Glicksman, *Climate Change Adaptation: A Collective Action Perspective on Federalism Considerations*, 40 ENVTL. L. 1159, 1174 (2010)).

²⁹⁸ See *supra*, note 294 and accompanying text.