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Beyond Localism: Harnessing State Adaptation Lawmaking to Facilitate Local Climate Resilience

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BEYOND LOCALISM: HARNESSING STATE ADAPTATION LAWMAKING TO FACILITATE LOCAL CLIMATE RESILIENCE

Sarah J. Adams-Schoen *

ABSTRACT

Notwithstanding the need for adaptation lawmaking to address a critical gap between climate-change related risks and preparedness in the United States, no coherent body of law exists that is aimed at reducing vulnerability to climate change. As a result of this gap in the law, market failures, and various “super wicked” attributes of hazard mitigation planning, local communities remain unprepared for present and future climate-related risks. Many U.S. communities continue to employ land-use planning and zoning practices that, at best, fail to mitigate these hazards, and, at worst, increase local vulnerability. Even localities that have implemented otherwise robust adaptation plans tend to focus almost entirely on accommodation strategies, even when retreat strategies are warranted. The result is the continued use of land-use planning and zoning practices that allow for intensified land uses in risk-prone areas. Such maladaptive development carries with it current and future costs from locking in infrastructure and patterns of development that place people and property in harm’s way.

When addressing this preparedness gap, many scholars focus on flaws in the federal flood insurance and disaster assistance programs. This Article builds on a small but growing literature on the potential for land use and other local lawmaking regimes to proactively facilitate climate resilience, and the barriers local governments face that cause them to continue to promote maladaptive development.

Using New York’s recently enacted adaptation law as a case study, I ask whether state mandates and incentives, although facially limiting of local autonomy, are nevertheless needed to empower local governments to overcome otherwise intractable obstacles to decreasing the intensity of development in vulnerable areas. I conclude by identifying specific attributes of state adaptation lawmaking that may be needed to support and encourage local government efforts to promote resilience. Ultimately, I conclude that, by helping local governments overcome barriers to robust adaptive development, state lawmaking has the potential to empower local governments to proactively move people and infrastructure out of harm’s way.

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INTRODUCTION¹

The housing market is booming in Long Beach, New York, a summer tourist destination and bedroom community of Manhattan.² Prospective homebuyers face bidding wars on properties that, less than three years ago, were literally underwater. Like many communities along the Atlantic coast, Long Beach was devastated by Hurricane Sandy.³ This barrier island city of approximately 33,000 residents suffered damages estimated at over \$1 billion from Hurricane Sandy, which inundated the municipality with floodwaters of three to seven feet, resulting in 68% of the housing stock sustaining “heavy or strong” damage.⁴

And Long Beach is not an anomaly. Housing markets are booming in Los Angeles, Tampa-St. Petersburg, and Phoenix, as well as many other communities facing substantial risks from flooding, heat waves, wildfires and other climate-related risks.⁵ One study estimates that by 2050, a 100-year storm⁶ would result in over 15 million dollars in structural damage in Los Angeles’ Venice Beach alone, assuming a 55-inch rise in sea level.⁷ A World Bank study recently identified Tampa as one

1. The title of this article invokes Richard Briffault’s articles, *Our Localism: Part I—The Structure of Local Government Law*, 90 COLUM. L. REV. 1 (1990) [hereinafter *Our Localism I*], and *Our Localism: Part II—Localism and Legal Theory*, 90 COLUM. L. REV. 346 (1990) [hereinafter *Our Localism II*]. These articles dissected and described differences between localism in practice and localism in theory, challenging positive and normative conceptions of local power, and “urg[ing] scholars to give greater attention to the state as a political and legal focal point in the system of local governments.” *Our Localism I*, *supra*, at 6. See also Laurie Reynolds, *A Role for Local Government Law in Federal-State-Local Disputes*, 43 URB. LAW. 977, 1013 n.1 (2011) (crediting Briffault with coining the term “localism,” which has “become an important consideration in the ongoing legal doctrinal debate about the proper role of local powers, local governments, and local autonomy in our federalist system”).

2. See Ruth Bashinsky, *Buying in Long Beach: Sand, Surf and A Rising Housing Market*, NEWSDAY (June 25, 2015), <http://www.newsday.com/classifieds/real-estate/buying-in-long-beach-sand-surf-and-a-rising-housing-market-1.10572697> (reporting rising housing market in City of Long Beach, New York, including frequent bidding wars on residential properties).

3. NY RISING CMTY. RECONSTRUCTION PROGRAM, LONG BEACH NY RISING COMMUNITY RECONSTRUCTION PLAN, at ES-1 (2014). Note that I refer to Sandy as a “hurricane” because, “although Sandy made landfall [near Brigantine, New Jersey] as an extratropical low, its strong winds, heavy rains and storm surge had been felt onshore for many hours while Sandy was still a hurricane.” ERIC S. BLAKE ET AL., TROPICAL CYCLONE REPORT: HURRICANE SANDY 22-29 (2012).

4. NY RISING, *supra* note 3, at ES-1, 9.

5. See Ingo Winzer, *Booms Are Back in These 25 Real Estate Markets*, FORBES (July 6, 2018), <https://www.forbes.com/sites/ingowinzer/2018/07/06/booms-are-back-in-these-25-real-estate-markets/#7c54a36b5386>; Darryl Fears, *Tampa Bay’s Coming Storm*, WASH. POST (July 28, 2017), https://www.washingtonpost.com/graphics/2017/health/environment/tampa-bay-climate-change/?utm_term=.74842efad855 (reporting on flood risk and a hot real estate market on the waterfront of Tampa).

6. A hydrologic event like a flood or storm is described as a 100-year event if the event is projected to have a one percent chance of being equaled or exceeded in any given year. See FEMA REGION 10, THE 100 YEAR FLOOD MYTH 2, <https://training.fema.gov/hiedu/docs/hazrm/handout%203-5.pdf> (last visited Dec. 21, 2018).

7. Megan M. Herzog & Sean B. Hecht, *Combatting Sea Level Rise in Southern California: How Local Governments Can Seize Adaptation Opportunities While Minimizing Legal Risk*, 19 HASTINGS WEST-NORTHWEST J. ENVTL. L. & POLICY 463, 490–91 (2013).

of the ten most at-risk areas on the globe.⁸ In 2017, Phoenix, which regularly experiences temperatures in excess of 110 degrees Fahrenheit, set a record for annual heat-related deaths,⁹ and the number of days with excessive heat across the southwestern United States is projected to continue increasing.¹⁰ Heat waves in particular have massive public health costs, often accounting for more fatalities per year than hurricanes, floods, lightning, or tornadoes.¹¹

The need for adaptation planning and lawmaking¹² to address a critical gap between climate-related risks and preparedness in the United States is clear. The Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5) projects that, with a 2°C increase in global average temperatures over pre-industrial levels, North American coastal cities will have to be highly adapted to maintain the current risk level of “medium.”¹³ Under a 4°C scenario, which appears more likely than a 2°C scenario,¹⁴ the IPCC projects that even highly adapted North American coastal cities will face high risks levels.¹⁵

Indeed, communities throughout the United States are already experiencing more frequent and more costly weather- and climate-related disasters.¹⁶ And yet, no coherent body of law exists that is aimed at reducing vulnerability to climate

8. See Stephane Hallegatte et al., *Future Flood Losses in Major Coastal Cities*, 3 NATURE CLIMATE CHANGE 802, 803 (2013) (reporting on study).

9. MARICOPA CTY. PUB. HEALTH, HEAT-ASSOCIATED DEATHS IN MARICOPA COUNTY, AZ PRELIMINARY REPORT FOR 2017 (2017).

10. Mary H. Hayden et al., *Differential Adaptive Capacity to Extreme Heat: A Phoenix, Arizona, Case Study*, 3 WEATHER, CLIMATE, & SOC'Y. 269, 269 (2011).

11. See Nat'l Oceanic & Atmospheric Ass'n, Nat'l Weather Serv. Office of Climate, Water, & Weather Servs., *Weather Fatalities 2017*, NAT'L WEATHER SERV., <http://www.nws.noaa.gov/om/hazstats.shtml> (last updated Apr. 25, 2018) (reporting that heat waves accounted for more deaths per year than other extreme weather events based on 30-year averages).

12. Adaptation in this context refers to planning and lawmaking that increases an area's resilience in the face of climate-related risks. See *infra* notes 102–30 and accompanying text (discussing adaptation planning and lawmaking in terms of protection, accommodation and retreat strategies); see also Lawrence Susskind & Danya Rumore, *Helping Coastal Communities Prepare for and Respond to Climate Change-Related Risks*, in MANAGING CLIMATE RISKS IN COASTAL COMMUNITIES: STRATEGIES FOR ENGAGEMENT, READINESS AND ADAPTATION 3, 8 (Lawrence Susskind et al. eds., 2015) (suggesting that adaptation be reframed as local climate preparedness and collective risk management).

13. See INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY 23 (2014) [hereinafter 2014 IPCC ADAPTATION REPORT].

14. See V. Ramanathan & Y. Feng, *On Avoiding Dangerous Anthropogenic Interference with the Climate System: Formidable Challenges Ahead*, 105 PROC. NAT'L ACAD. SCI. 14245, 14245 (2008) (estimating global warming of 2.4°C even if greenhouse gas emissions concentrations held to 2005 levels).

15. The 2014 IPCC Adaptation Report characterizes the projected risk under a 4°C increase, even with high adaptation, as between “medium” and “very high.” 2014 IPCC ADAPTATION REPORT, *supra* note 13, at 23.

16. See *supra* notes 5, 7-10.

change.¹⁷ Congress has yet to enact any federal laws addressing climate change adaptation,¹⁸ or even to amend existing statutes or regulations to address climate adaptation in a piecemeal fashion.¹⁹ In addition, President Trump has rescinded the federal executive actions taken under the Obama Administration addressing climate resilience.²⁰

This gap in federal law is not filled at the state or local levels. Few states have enacted state laws addressing climate change adaptation,²¹ and state administrative guidance tends to focus on mitigation and ignore or even disavow adaptation.²² Although many sources laud the work of local governments with respect to adaptation,²³ the vast majority of U.S. municipalities have yet to complete an adaptation assessment of their local laws and policies.²⁴ Additionally, most municipalities that have begun adaptation planning focus on accommodation strategies and eschew retreat,²⁵ even when retreat is needed to move people and critical infrastructure out of harm's way.²⁶ Despite recognition across many sectors that local government

17. See Vicki Arroyo & Terri Cruce, *State and Local Adaptation*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS* 569, 569 (Michael Gerrard & Katrina Fischer Kuh eds. 2012).

18. Climate legislation has been introduced, but failed to pass, which would have required or provided incentives for adaptation plans and would have provided resources for states and municipalities to adopt and implement adaptation plans and policies. See, e.g., FEMA Disaster Assistance Reform Act of 2015, H.R. 1471, 114th Cong. § 1 (2015) (proposed legislation amending Stafford Act, 42 U.S.C. §§ 5121-5207), <http://transportation.house.gov/UploadedFiles/HR1471.pdf>; see generally Arroyo & Cruce, *supra* note 17, at 569; see also *infra* Part I.B.3 (discussing fragmented federal laws regulating flood-prone areas and the WUI).

19. At the federal level, the United States has amended nonclimate-related statutes and regulations to create a patchwork regulatory scheme to reduce emissions, but not even a patchwork approach is occurring with respect to adaptation. See generally Michael Gerrard, *Introduction and Overview*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS* 11 (Michael Gerrard & Katrina Fischer Kuh eds. 2012).

20. *Regulation Database – Executive Orders*, COLUM. L. SCH., SABIN CTR. FOR CLIMATE CHANGE L., <http://columbiaclimatelaw.com/resources/climate-deregulation-tracker/database/executive-orders/> (last visited Oct. 17, 2018).

21. See generally TERRI L. CRUCE, *ADAPTATION PLANNING – WHAT U.S. STATES AND LOCALITIES ARE DOING* (2009), <https://www.c2es.org/site/assets/uploads/2009/08/state-local-adaptation-planning.pdf> (surveying states).

22. See JESSICA WENTZ, *ASSESSING THE IMPACTS OF CLIMATE CHANGE ON THE BUILT ENVIRONMENT UNDER NEPA AND STATE EIA LAWS: A SURVEY OF CURRENT PRACTICES AND RECOMMENDATIONS FOR MODEL PROTOCOLS* 10 (2015).

23. See Rajendra K. PACHAURI, ET AL., *IPCC CLIMATE CHANGE 2014: SYNTHESIS REPORT* 107 (2014) (“There is a significant increase in the number of planned adaptation responses at the local level in rural and urban communities of developed and developing countries since the AR4.”).

24. JOANN CARMIN ET AL., *PROGRESS AND CHALLENGES IN URBAN CLIMATE ADAPTATION PLANNING: RESULTS OF A GLOBAL SURVEY* 10 (2012); see also *infra* Part I.B (discussing local preparedness gap).

25. See *infra* notes 102–30 and accompanying text (discussing climate change adaptation in terms of “protection,” “accommodation,” and “retreat” strategies).

26. See *infra* notes 135–37 and accompanying text (discussing failure to adopt retreat strategies).

action is essential to climate resilience,²⁷ legal scholars have written little about the obstacles local governments face with respect to adaptation.²⁸

Nor is the market providing a reliable mechanism for shifting development toward less vulnerable areas or otherwise incentivizing anything akin to comprehensive adaptation. Only a handful of communities have seen housing bubbles burst in response to the costs associated with disaster and rebuilding.²⁹ Despite the fact that all or nearly all of a community lies within a vulnerable area,³⁰ property values in many vulnerable areas remain stable or are even on the rise.³¹

This Article addresses this problem and the gap in the literature by examining mechanisms by which state lawmaking can help local governments decrease the intensity of development in vulnerable areas or shift development from vulnerable to less vulnerable areas. Part I examines the appropriate jurisdictional level for lawmaking to effectively punctuate³² local climate resilience policies and concludes

27. See, e.g., Aromar Revi et al., *Urban Areas*, in INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY, CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 535, 541 (C.B. Field et al. eds., 2014) (highlighting the importance of “city and municipal governments acting now to incorporate climate change adaptation into their development plans and policies and infrastructure investments” and characterizing “[a]ction in urban centers [as] essential to successful global climate change adaptation”).

28. But see *infra* notes 94, 96, 139, and 334 (citing legal scholarship discussing barriers to local adaptation planning and lawmaking). Scholars have written more on Fifth Amendment takings risks associated with local regulations that limit development. See, e.g., A. Dan Tarlock & Deborah M. Chizewer, *Living with Water in A Climate-Changed World: Will Federal Flood Policy Sink or Swim?*, 46 ENVTL. L. 491, 528–35 (2016); J. Peter Byrne, *The Cathedral Engulfed: Sea-Level Rise, Property Rights, and Time*, 73 LA. L. REV. 69, 85–115 (2012); John R. Nolon, *Land Use and Climate Change: Lawyers Negotiating Above Regulation*, 78 BROOK. L. REV. 521, 525–26, 558–67 (2013) (concluding that the core principle of *Lucas v. South Carolina Coastal Council*, 505 U.S. 1003 (1992), “combines with other practical and political difficulties to militate against severe development restrictions in coastal areas” and providing solutions to negotiate around this obstacle).

29. See John R. Nolon, *Land Use and Climate Change Bubbles: Resilience, Retreat, and Due Diligence*, 39 WM. & MARY ENVTL. L. & POL’Y REV. 321, 337–50 (2015) (discussing six examples of real estate bubbles that have collapsed as a result of climate change-related hazards).

30. See, e.g., *Geographic Information Gateway*, N.Y. ST., <http://opdgig.dos.ny.gov/#/map> (last visited Aug. 23, 2018) (click view, select Flood Hazard Zones layer); *FEMA Flood Map Service Center*, FED. EMERGENCY MGMT. AGENCY, <http://msc.fema.gov/portal> (last visited Aug. 23, 2018); David W. Chen, *In New York, Drawing Flood Maps is a ‘Game of Inches’*, N.Y. TIMES (Jan. 7, 2018), <https://www.nytimes.com/2018/01/07/nyregion/new-york-city-flood-maps-fema.html>.

31. See *supra* notes 2–9 and accompanying text; *infra* Part I.B (discussing demographic and real estate trends in vulnerable areas).

32. “Punctuate” refers to a more than incremental shift in law or policy. See generally BRYAN D. JONES & FRANK R. BAUMGARTNER, *THE POLITICS OF ATTENTION: HOW GOVERNMENT PRIORITIZES PROBLEMS* 49–50 (2005) (discussing windows in which policy equilibria may be punctuated); see also Sarah J. Adams-Schoen, *Taming the Super Wicked Problem of Waterfront Hazard Mitigation Planning: The Role of Municipal Communication Strategies*, in ROBIN KUNDIS CRAIG & STEPHEN R. MILLER, *CONTEMPORARY ISSUES IN CLIMATE CHANGE LAW AND POLICY: ESSAYS INSPIRED BY THE IPCC* 123, 136–37 (Robin Kundis Craig & Stephen R. Miller, eds., 2016) (analyzing failures to

that local lawmaking is essential to creating disaster resilient communities.³³ However, because of various intractable technical and socio-political obstacles—which could also be characterized as “super wicked” attributes of this policy problem³⁴—robust resilience lawmaking is largely unrealized at the local level.³⁵ Moreover, many local governments continue to allow or even encourage patterns of development that magnify the risks.³⁶ Part II examines as a case study a recent state adaptation law, the New York Community Risk and Resiliency Act of 2014 (CRRA),³⁷ and asks whether the New York law could serve as a model for other states seeking to help local governments overcome the super wicked attributes of the climate resilience problem.³⁸

I. REVISITING LOCALISM AND THE FALSE DICHOTOMY OF LOCAL POWER/LOCAL POWERLESSNESS

The climate preparedness gap in the United States is a super wicked policy problem that challenges theoretical conceptions of localism, and, relatedly, subsidiarity and polycentrism.³⁹ On the one hand, local governments are uniquely suited to adapt local communities to climate-related risks.⁴⁰ On the other hand, most are failing doing so.⁴¹ Moreover, the “super wicked” attributes of this policy problem are similar across otherwise dissimilar vulnerable communities, including flood-prone communities and communities in the wildland-urban interface (WUI)—i.e., “where humans and their development meet or intermix with wildland fuel” such as dry grasses and trees.⁴²

But most have not done so. The vast majority of communities in the United States are either failing to adapt or adopting adaptation strategies focused almost exclusively on accommodation, even when retreat is warranted.⁴³ Local adaptation

more than incrementally shift local waterfront hazard mitigation policies even following major disasters in light of Jones’ and Baumgartner’s empirical research on punctuating policy equilibria).

33. See *infra* Part I.A.

34. See *infra* Part I.B.

35. See *infra* Part I.B.

36. See *infra* Part I.B.1.

37. Community Risk and Resiliency Act, 2014 N.Y. Laws 1115–19.

38. See *infra* Part II.B.

39. See *infra* notes 69–74 and accompanying text (discussing the principle of subsidiarity) and notes 75–79 and accompanying text (discussing polycentrism).

40. See *infra* Part I.A.

41. See *infra* Part I.B.

42. Urban Wildland Interface Communities Within the Vicinity of Federal Lands That Are at High Risk from Wildfire, 66 Fed. Reg. 751, 752–53 (Jan. 4, 2001) (notices); see also Stephen R. Miller, *Planning for Wildfire in the Wildland-Urban Interface: A Guide for Western Communities*, 49 URB. LAW. 207, 212–14 (2017) (discussing complexities of WUI definition).

43. See *infra* Part I.B.

lawmaking that restricts development has proven to be infeasible in all but a few communities—especially in high-value areas like some waterfronts and parts of the WUI.⁴⁴ Even in areas with low property values, communities often respond to retreat with skepticism and hostility.⁴⁵ Consequently, maladaptive development continues in many vulnerable areas.⁴⁶

A. *The Essential Local Role in Creating Climate Resilient Communities*

Local land use and zoning laws offer one of the most effective opportunities to create more resilient patterns of development.⁴⁷ Generalizations about local control are difficult to make given the wide variation among state approaches to delegation of authority to local units of government and “the tremendous range of judicial and legislative attitudes about the scope of local powers.”⁴⁸ Despite this, nearly all states have delegated at least some form of home rule to at least some local government units.⁴⁹ With broad authority for local decision-making delegated to the local level, such municipal governments often “play a vital governance role,” with responsibility for “drinking water, social services, sewerage, zoning, schools, roads, parks, police, courts, jails, trash disposal—and more.”⁵⁰

Not only do most local governments have authority to adopt regulations that minimize their communities’ climate-related risks,⁵¹ local governments are also uniquely suited to successfully navigate many of the challenges of climate change adaptation planning and lawmaking. Scholars in the fields of environmental law,

44. See *infra* Part I.B. For discussion of communities that have restricted development, see Non-*supra* note 29; Jessica A. Bacher, *Yielding to the Rising Sea: The Land Use Challenge*, 38 REAL EST. L.J. 96 (2009).

45. See Alexander B. Lemann, *Stronger Than the Storm: Disaster Law in A Defiant Age*, 78 LA. L. REV. 437, 442–44 (2018) (discussing fierce resistance to retreat generally and by New Orleans residents specifically as expressions of revenge, culture and political resistance).

46. See *infra* Part I.B.

47. Patricia Salkin, *Sustainability at the Edge: The Opportunity and Responsibility of Local Governments to Most Effectively Plan for Natural Disaster Mitigation*, 38 ENVTL. L. REP. 10158, 10158 (2008).

48. Reynolds, *supra* note 1, at 1000.

49. *Id.* at 996; see also U.S. ADVISORY COMM’N ON INTERGOVERNMENTAL REL., M-186, STATE LAWS GOVERNING LOCAL GOVERNMENT STRUCTURE AND ADMINISTRATION 20-23 (1993); Lynn A. Baker & Daniel B. Rodriguez, *Constitutional Home Rule and Judicial Scrutiny*, 86 DENV. U. L. REV. 1337, 1339 nn.11-12 (2009) (identifying forty-six states with home rule).

50. N.Y. STATE BAR ASS’N COMM’N ON THE N.Y. STATE CONST., REPORT AND RECOMMENDATIONS CONCERNING CONSTITUTIONAL HOME RULE 1 (2016).

51. See, e.g., *Vartelas v. Water Res. Comm’n*, 153 A.2d 822, 824–25 (Conn. 1959) (noting that prevention of risky development is a valid exercise of the police power and holding that landowner plaintiff who did not request an exception to the development prohibition failed to exhaust remedies); *Turnpike Realty Co. v. Town of Dedham*, 284 N.E.2d 891, 899 (Mass. 1972); see also Debbie M. Chizewer & A. Dan Tarlock, *New Challenges for Urban Areas Facing Flood Risks*, 40 FORDHAM URB. L.J. 1739, 1752–68 (2013) (discussing local government role in limiting flood damage); Allison Dunham, *Flood Control Via the Police Power*, 107 U. PA. L. REV. 1098, 1107 (1959).

land use law, state and local government law, economics, planning, and public policy tend to agree that local governance—primarily, albeit not exclusively—of climate adaptation is preferable to governance at higher scales.⁵² For example, urban planning scholars Lawrence Susskind and Danya Rumore argue that climate change adaptation “is primarily, although by no means entirely, a local issue. State, federal and international initiatives can support adaptation, but the impacts of climate change risk are largely local, as are the efforts needed to respond to them.”⁵³ Climatologist Cynthia Rosenzweig and colleagues characterize local communities “as important laboratories for climate change action.”⁵⁴

The proliferation of international organizations and projects focusing on supporting local governments in their climate resilience efforts illustrates a growing consensus that local governments have an essential role in creating climate resilient communities. These organizations and projects include ICLEI – Local Governments for Sustainability,⁵⁵ C40 Cities,⁵⁶ the Global Covenant of Mayors for Climate & Energy,⁵⁷ the Urban Climate Change Research Network,⁵⁸ the Urbanization and Global Environmental Change project of the International Human Dimensions Programme,⁵⁹ the UN-Habitat’s biannual Global Reports on Human Settlement,⁶⁰ and the Rockefeller Foundation’s 100 Resilient Cities program.⁶¹

52. See generally ANNE SIDERS, *MANAGED COASTAL RETREAT: A LEGAL HANDBOOK ON SHIFTING DEVELOPMENT AWAY FROM VULNERABLE AREAS* 27 (2013) (“Increased and improved local planning has been consistently requested by academics, environmental organizations, developers, and the American Planning Association.”). See, e.g., Elinor Ostrom et al., *Revisiting the Commons: Local Lessons, Global Challenges*, 284 *SCIENCE* 278, 280-81 (1999) (advocating for parallel local, state, and national governance regimes to engage in extensive trial-and-error learning to solve collective action environmental issues); Lars Otto Næss et al., *Institutional Adaptation to Climate Change: Flood Responses at the Municipal Level in Norway*, 15 *GLOBAL ENVTL. CHANGE* 125 (2005) (discussing local level as optimal level for adaptation); Arun Agrawal, *The World Bank, The Role of Local Institutions in Adaptation to Climate Change* 11 (Int’l Forestry Res. & Inst. Program, Working Paper # W08I-3, Mar. 5-6, 2008), <http://www.umich.edu/~ifri/Publications/W08I3%20Arun%20Agrawal.pdf> (“local institutions play a crucial role in influencing the adaptive capacity of communities ex ante, and the adaptation choices made by community members ex post”).

53. Susskind & Rumore, *supra* note 12, at 4–5.

54. CYNTHIA ROSENZWEIG ET AL., *CLIMATE CHANGE AND CITIES: FIRST ASSESSMENT REPORT OF THE URBAN CLIMATE CHANGE RESEARCH NETWORK*, at xxii (2011).

55. ICLEI – LOCAL GOVERNMENTS FOR SUSTAINABILITY, <http://www.iclei.org/> (last visited Aug. 2, 2018).

56. C40 CITIES, <https://www.c40.org/> (last visited Aug. 2, 2018).

57. GLOBAL COVENANT OF MAYORS FOR CLIMATE & ENERGY, <https://www.globalcovenantofmayors.org/> (last visited Aug. 2, 2018).

58. EARTH INST., COLUM. U., *URB. CLIMATE CHANGE RES. NETWORK*, <http://uccrn.org/> (last visited Aug. 2, 2018).

59. URBANIZATION & GLOBAL ENVTL. CHANGE: A FUTURE EARTH PROJECT, <https://ugec.org/> (last visited Aug. 2, 2018).

60. See, e.g., UN-HABITAT, *PLANNING AND DESIGN FOR SUSTAINABLE URBAN MOBILITY: GLOBAL REPORT ON HUMAN SETTLEMENTS 2013* (2013).

Similarly, the One Planet Charter, announced in December 2017 at the One Planet Summit in Paris, recognizes that “[l]ong-term planning enables cities to develop a coherent strategy, prioritize resources, build consensus, and clarify roles and responsibilities.”⁶²

Domestic indicators of the essential role of local governments include the emergence of dozens of nonprofits; academic institutes; and local, regional, state and federal initiatives related to local governance of climate resilience. These include the National Association of Climate Resilience Planners⁶³ and the Urban Land Institute’s Returns on Resilience Program;⁶⁴ local climate resilience projects and publications of the Georgetown Climate Center,⁶⁵ Land Use Law Center of the Elisabeth Haub School of Law at Pace University,⁶⁶ and Columbia University’s Sabin Center for Climate Change Law;⁶⁷ community resilience projects of FEMA, the National Oceanic and Atmospheric Administration (NOAA), and the now disbanded Obama Administration’s State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience.⁶⁸

Recognition of the essential role of local governments in climate resilience governance is grounded in pragmatism, and may also reflect acceptance of localism and subsidiarity principles as normative guideposts, at least with respect to land use regulation.⁶⁹ As a practical matter, “[a]daptation strategies need to take account

61. *100 Resilient Cities*, ROCKEFELLER FOUND., <https://www.rockefellerfoundation.org/our-work/initiatives/100-resilient-cities/> (last visited Aug. 2, 2018). See also *Rosenzweig et al.*, *supra* note 54, at 910–11 (discussing the C40 Cities Climate Leadership Group, the World Mayors Council on Climate Change, the Urban Climate Change Research Network, the Urbanization and Global Environmental Change project of the International Human Dimensions Programme, the UN-Habitat’s 2011 Global Report on Human Settlement, and the World Bank Institute’s Urban and Climate Change Practice Group).

62. Press Release, Global Covenant of Mayors for Climate & Energy, Join the One Planet Charter and Let’s Step Up Climate Action in 2018! (June 12, 2018), <https://www.globalcovenantofmayors.org/press/join-one-planet-charter-lets-step-climate-action-2018/>.

63. NAT’L ASS’N OF CLIMATE RESILIENCE PLANNERS, <https://www.nacrp.org/> (last visited Aug. 2, 2018).

64. *Returns on Resilience*, URB. LAND INST., <http://returnsonresilience.uli.org/> (last visited Aug. 2, 2018).

65. GEO. CLIMATE CTR., <http://www.georgetownclimate.org/> (last visited Aug. 2, 2018).

66. *Land Use Law Center*, ELISABETH HAUB SCH. L. PACE U., <https://law.pace.edu/landuse> (last visited Aug. 2, 2018).

67. COLUM. L. SCH., SABIN CTR. FOR CLIMATE CHANGE L., <http://columbiaclimatelaw.com/> (last visited Aug. 2, 2018).

68. Council on Envtl. Quality, *State, Local, and Tribal Leaders Task Force on Climate Preparedness and Resilience*, OBAMA WHITE HOUSE ARCHIVES, <https://obamawhitehouse.archives.gov/administration/eop/ceq/initiatives/resilience/taskforce> (last visited Aug. 2, 2018).

69. Although preference for local, as opposed to federal, governance of environmental law tends to align with free market proponents, preference for local governance of land use is more generally accepted in the United States. See, e.g., James L. Huffman, *Making Environmental Regulation More Adaptive Through Decentralization: The Case for Subsidiarity*, 52 KAN. L. REV. 1377 (2004) (arguing for free market environmentalism and local governance of environmental laws); Briffault, *Our Localism II*, *supra*

of local resources, geography and context-specific risks,”⁷⁰ as well as local culture and politics, which “influence[s] which adaptation approaches are most likely to succeed in a given place.”⁷¹ In other words, adaptation strategies are often site-specific⁷² and place-dependent,⁷³ and local institutions usually possess a greater understanding of local conditions.⁷⁴

With respect to the WUI, a study involving hundreds of hours of interviews with wildfire experts and communities around the West concluded that effective wildfire planning requires active involvement of the development community and the citizens who live in the potential path of wildfires.⁷⁵ The same is also true of effective planning for flood-related risks.⁷⁶ Polycentric problems like these, which implicate numerous interconnected community interests, are better reconciled through collaborative processes that include the most affected stakeholders.⁷⁷ Collaborative land use planning processes offer an opportunity to shift norms and values toward resilience.⁷⁸ Participants in collaborative planning processes not only

note 1, at 452 (land use rules “form the heart of local autonomy since [they are] closely connected to core areas of personal autonomy and many people want the locus of decision making over these matters vested in the governments they feel are closest to the community”); *but see* FRED BOSSELMAN & DAVID CALLIES, *THE QUIET REVOLUTION IN LAND USE CONTROL* 33 (1971) (asserting that certain land use issues transcend local government boundaries and competencies); Nestor M. Davidson, *Cooperative Localism: Federal-Local Collaboration in an Era of State Sovereignty*, 93 VA. L. REV. 959, 968 (2007) (“Federal environmental law intertwines intimately with local land-use regulation.”).

70. Susskind & Rumore, *supra* note 12, at 8.

71. *Id.*

72. Thomas J. Wilbanks & Jayant Sathaye, *Integrating Mitigation and Adaptation as Responses to Climate Change: A Synthesis*, 12 MITIGATION & ADAPTATION STRATEGIES FOR GLOBAL CHANGE 957, 959 (2007).

73. Frederick Ato Armah et al., *Assessing Barriers to Adaptation to Climate Change in Coastal Tanzania: Does Where You Live Matter?*, 37 POPULATION & ENV'T L., 231, 241 (2015).

74. Orr Karassin, *Mind the Gap: Knowledge and Need in Regulating Adaptation to Climate Change*, 22 GEO. INT'L ENVTL. L. REV. 383, 416 (2010).

75. Stephen R. Miller, *Planning for Wildfire in the Wildland-Urban Interface: A Guide for Western Communities*, 49 URB. LAW. 207, 207–08 (2017).

76. SIDERS, *supra* note 52, at 27 (“Coastal management planning requires extensive local coordination, and local planning and implementation therefore play a critical role in achieving broader state-wide and regional hazard mitigation goals. . . . Local plans provide the best opportunity for public participation and for community tailoring.”).

77. SEAN NOLON ET AL., *LAND IN CONFLICT: MANAGING AND RESOLVING LAND USE DISPUTES* 10 (2013); *see, e.g.*, Bruce Evan Goldstein & William Hale Butler, *Expanding the Scope and Impact of Collaborative Planning: Combining Multi-Stakeholder Collaboration and Communities of Practice in a Learning Network*, 76 J. AM. PLAN. ASS'N 238, 241 (2010) (evaluating collaborative planning process of The Fire Learning Network, established by The Nature Conservancy, the U.S. Forest Service, and the U.S. Department of Interior “to catalyze the restoration of fire-dependent ecosystems by initiating and supporting multi-stakeholder collaboratives that would develop and implement ecological fire restoration plans at a landscape scale”).

78. *See* NOLON ET AL., *supra* note 77, at 10.

influence the norms and values underlying the plan, but also experience shifts in their own values as a result of their participation.⁷⁹

Many land use planning processes facilitate collaborative decision-making through intensive, personal engagement in project planning⁸⁰—for example, though the use of community engagement initiatives, visioning, and charrettes.⁸¹ These processes often engage participants in self-advocacy, public commitment to a vision, and validation of the vision through shared personal experiences.⁸² Research on changing deeply held beliefs suggests that these attributes—self-advocacy, public commitment, and validation through personal experience—can effect lasting, cognitively accessible changes in participants’ deeply held beliefs.⁸³ This type of community-focused planning can be facilitated and aided by nonlocal institutions.⁸⁴ Typically, however, local institutions have easier access to local so-

79. See John R. Nolon, *Champions of Change: Reinventing Democracy Through Land Law Reform*, 30 HARV. ENVTL. L. REV. 1, 11-12 (2006) (analyzing changes within and among communities observed in author’s experience working with local governments).

80. LAWRENCE SUSSKIND, MIEKE VAN DER WANSEN & ARMAND CICCARELLI, *MEDIATING LAND USE DISPUTES: PROS AND CONS* 5 (Ann LeRoyed ed., 2000) (“Confronted by escalating conflicts whenever land use development or resource allocation decisions must be made, many planners are turning to a third planning model based on consensus building and assisted negotiation.”); Danielle Bergstrom et al., *The Sustainable Communities Initiative: The Community Engagement Guide for Sustainable Communities*, 22 J. AFFORDABLE HOUSING & COMMUNITY DEV. L. 191, 194 (2014) (“Tools and methods designed to increase participation in planning . . . are becoming ubiquitous. . .”). Cf. NOLON ET AL., *supra* note 77, at 9-11 (noting that while “most land use systems are designed to adjudicate rights, not reconcile interests,” under the traditional method, more currently “communities [have] decide[d] to supplement regular processes with the mutual gains approach” that implements “collaborative problem solving”).

81. Craig Anthony Arnold, *The Structure of the Land Use Regulatory System in the United States*, 22 J. LAND USE & ENVTL. L. 441, 476 (2007) (noting increasing use of participatory planning techniques, including design charrettes, scenarios development, impact assessment, and participatory land use mapping). A charrette is a collaborative brainstorming session “intended to build consensus among participants, develop specific design goals and solutions for a project, and motivate participants and stakeholders to be committed to reaching those goals.” GAIL LINDSEY ET AL., U.S. DEP’T OF ENERGY, NAT’L RENEWABLE ENERGY LAB., *A HANDBOOK FOR PLANNING AND CONDUCTING CHARRETTES FOR HIGH-PERFORMANCE PROJECTS* 1 (2d ed. 2012).

82. See Goldstein & Butler, *supra* note 77, at 241 (noting role of shared visions and stakeholder engagement); NOLON ET AL., *supra* note 77, at 15 (discussing use of joint learning); *id.* at 19 (discussing exploration of values and interests as opposed to positions); METRO. AREA PLANNING COUNCIL, *COMMUNITY ENGAGEMENT GUIDE* 10 (2016) (listing methods of community engagement, including advocacy training and visioning workshops).

83. Joshua Aronson et al., *Reducing the Effects of Stereotype Threat on African American College Students by Shaping Theories of Intelligence*, 38 J. EXPERIMENTAL SOC. PSYCHOL. 113, 116–23 (2002) (empirical study identifying conditions for influencing persistent, cognitively-accessible changes in attitudes including advocacy in a person’s own words, public commitment and validation by personal experience).

84. Lars Otto Næss et al., *Institutional Adaptation to Climate Change: Flood Responses at the Municipal Level in Norway*, 15 GLOBAL ENVTL. CHANGE 125, 125 (2005) (“[L]ocal decisions are shaped by . . . interactions with structures at higher geographical scales that may mandate, encourage and inform actions.”); see, e.g., Goldstein & Butler, *supra* note 77, at 239–240 (describing the Fire Learning Network as “a nationwide network of landscape-scale multi-stakeholder collaborative planning efforts,” which

cial processes and stakeholders, are able to gather support from local networks, and can transfer knowledge more effectively to these local stakeholders and networks.⁸⁵

Additionally, many scholars observe that, because the effects of climate change are experienced most acutely at the local level,⁸⁶ local governments are on the so-called “frontline” of adaptation efforts.⁸⁷ As a result, some scholars argue that local entities have a greater incentive than nonlocal entities to regulate in this area.⁸⁸ However, various factors can cause local governments to have weak incentives to effectively regulate climate risks.⁸⁹ For example, mismatches in scale, which arise when decisions are made at one scale and borne at other scales, can weaken local government incentive to regulate risks when decisions are made at the state or federal level, but the brunt of those decisions is borne at the local level.⁹⁰ Such mismatches in scale can also result in a failure to learn from local knowledge of climate risks.⁹¹ Some scholars urge that incentive problems like these can be overcome by vesting regulatory authority in the lowest level of government capable of solving the problem.⁹²

was established following a roundtable co-hosted by The Nature Conservancy and the U.S. Forest Service).

85. Karassin, *supra* note 74, at 416 (citing Ted Rutland & Alex Aylett, *The Work of Policy: Actor Networks, Governmentality, and Local Action on Climate Change in Portland, Oregon*, 26 ENV'T & PLAN. D 627, 636 (2008)) (emphasizing importance of local governance in enlisting local action networks for information sharing and participation in agenda setting).

86. See generally Næss et al., *supra* note 84, at 125 (citing studies showing climate vulnerability and its causes are location-specific).

87. Susskind & Rumore, *supra* note 12, at 8 (referring to local entities as “on the frontline of adaptation efforts”) (citation omitted); J. Kevin Healy & L. Margaret Barry, *Local Initiatives*, in GLOBAL CLIMATE CHANGE AND U.S. LAW 375, 375 (Michael B. Gerrard & Jody Freeman eds., 2d ed. 2014) (referring to local jurisdictions as “the government entities on the front line in protecting the health and welfare of their citizens”).

88. See, e.g., Karassin, *supra* note 74, at 416; see also Huffman, *supra* note 69, at 1399 (asserting that “[t]he principle of subsidiarity . . . reflect[s] a recognition that we are more likely to get the incentives right if we keep decisions close to home, [w]here individuals experience the costs and benefits of their actions”).

89. See, e.g., Næss et al., *supra* note 84, at 135 (concluding that the “current institutional framework [in Norway] for flood management gives weak incentives for proactive flood management at the municipal level”); see Adams-Schoen, *supra* note 32, at 135–37 (concluding that super wicked attributes of waterfront hazard mitigation planning prevent local governments from effectively adapting to climate vulnerabilities).

90. See generally Karassin, *supra* note 74, at 415–18 (discussing “questions of scale” with respect to climate change adaptation governance); see also Næss et al., *supra* note 84, at 135 (concluding that centralized decision-making in Norway weakened local incentives to regulate flood risk); but see *id.* at 136 (asserting that, although “the local level is critical,” robust adaptation will likely require measures at various scales and coordination between scales).

91. See, e.g., Næss et al., *supra* note 84, at 136 (“Our case study exemplifies how local knowledge is not well integrated into formal risk management procedures.”).

92. E.g., Jesse B. Abrams et al., *Re-Envisioning Community-Wildfire Relations in the U.S. West as Adaptive Governance*, 20 ECOLOGY & SOC'Y., no. 3, 2015, art. 34; but see *id.* (“Just what constitutes the

Perhaps the most significant variable with respect to the essentiality of local governments in adaptation lawmaking is that the principal technique for controlling how land is used is the local zoning ordinance.⁹³ Moreover, the use of land—including patterns of development and placement and design of structures and infrastructure—determines in large part a community’s resilience to climate-related risks.⁹⁴ This is true even in the federal coastal zone and other floodplains and watersheds, which are often subjected to a morass of overlapping local, state, and federal authority.⁹⁵ Local governments also have an array of tools that can help communities adapt to climate change-related conditions in other vulnerable areas as well, including urban areas threatened by intense summer heat,⁹⁶ agricultural areas threatened by changing precipitation patterns,⁹⁷ and developed areas threatened by wildfire.⁹⁸ As the Urban Climate Change Research Network’s First Assessment

level capable of problem solving . . . is not a simple question in the case of a multiscale and wicked problem such as wildfire.”).

93. John R. Nolon, *The Erosion of Home Rule Through the Emergence of State-Interests in Land Use Control*, 10 PACE ENVTL. L. REV. 497, 499 (1993).

94. See Salkin, *supra* note 47, at 10159 (“Land use patterns are determined, infrastructure is designed and provided, and many other development issues are decided at the local level, where natural hazards are experienced and losses are suffered most directly.”); Alice Kaswan, *Climate Change Adaptation and Land Use: Exploring the Federal Role*, 47 J. MARSHALL L. REV. 509, 513 (2013) (“Land use patterns play a critical role in determining vulnerability to direct harm, including exposure to climate risks like flooding, erosion, and wildfire.”).

95. The local, state and federal legal and policy framework governing coastal and estuarine planning and management often includes more than a dozen federal, county, state and local laws implemented by an even greater number of agencies, departments, commissions and task forces. See Submerged Lands Act of 1953, 43 U.S.C. § 1312 (2006); see also The Coastal Zone Management Act, 16 U.S.C. § 1454 (2012); Coastal Barrier Resources Act, 16 U.S.C. § 1452(2)(K) (2006); N.Y. ENVTL. CONSERV. LAW § 34-0102(5) (McKinney 2012); New York State Waterfront Revitalization of Coastal Areas and Inland Waterways Act, N.Y. COMP. CODES R. & REGS. tit. 19, § 600.1(c) (2012); Tidal Wetlands Act, N.Y. COMP. CODES R. & REGS. tit. 6, § 661.1 (2018); New York Coastal Erosion Hazard Area Act (CEHA) N.Y. ENVTL. CONSERV. LAW § 34-0102(5) (McKinney 2012).

96. See Kaswan, *supra* note 94, at 517 (2013) (“Urban design elements and building codes significantly influence the ‘urban heat island’ effect.”); Blake Hudson, *Reconstituting Land-Use Federalism to Address Transitory and Perpetual Disasters: The Bimodal Federalism Framework*, 2011 BYU L. REV. 1991, 2006–08 (2011) (identifying a range of land use strategies for mitigating extreme urban heat).

97. See Patricia E. Salkin, *Sustainability and Land Use Planning: Greening State and Local Land Use Plans and Regulations to Address Climate Change Challenges and Preserve Resources for Future Generations*, 34 WM. & MARY ENVTL. L. & POL’Y REV. 121, 125 (2009) (noting that most states require zoning regulations be developed and implemented in accordance with a comprehensive land use plan, and comprehensive plans often address agriculture, among other issues); see also THOMAS E. ROBERTS ET AL., AGRICULTURAL USES, LAND USE PLANNING AND DEVELOPMENT REGULATION LAW § 4:8 (3d ed., 2013) (discussing agricultural zoning).

98. Stephen R. Miller, *Local Environmental Regulation in the Mountain West*, 46 REAL EST. REV. J. ART 63, 73–74 (2015) (discussing local governments’ regulation of land use under delegated police powers to protect against wildfires, including Flagstaff, Arizona’s adoption of the International Code Council’s International Wildland-Urban Interface Code (IWUIC), use of an overlay zone, and regional plan to increase the city’s resilience against wildfire).

Report on Climate Change and Cities (ARC3) concluded, how communities are structured can amplify or ameliorate the effects of extreme heat, flooding, wildfire, and other climate-related risks.⁹⁹ This conclusion was echoed in IPCC's Fifth Assessment Report as well.¹⁰⁰ Accordingly, as Miller has observed in the context of wildfire planning, which has been dominated by federal agencies, failure to engage local governments stymies adaptation efforts.¹⁰¹

With respect to specific local tools for facilitating climate resilience, adaptation strategies can generally be characterized as protection, accommodation, or retreat strategies.¹⁰² Protection involves efforts to protect existing structures from threats like storm surge with, for example, regulations allowing or requiring coastal armoring structures.¹⁰³ Protection may be desirable in densely developed areas and areas with large pieces of critical municipal infrastructure like power plants.¹⁰⁴

Accommodation focuses on increasing the resilience of structures to accommodate anticipated threats, and thereby allowing development to continue in vulnerable areas.¹⁰⁵ Herzog and Hecht observe that "accommodation strategies are typically the easiest and quickest adaptation strategies for local governments to deploy because they harness familiar land use tools."¹⁰⁶ In the flood hazard context, accommodation strategies typically include regulatory requirements that new structures meet construction standards to protect them from floods.¹⁰⁷ In the wildfire hazard context, the Firewise program's "vegetative zone" approach is an example of a protection and accommodation strategy.¹⁰⁸ Within the vegetative zone, which is typically 100 to 200 feet around a structure, steps are taken to protect the structure

99. URBAN CLIMATE CHANGE RESEARCH NETWORK (UCCRN), CLIMATE CHANGE AND CITIES: FIRST ASSESSMENT REPORT OF THE URBAN CLIMATE CHANGE RESEARCH NETWORK xxi (Cynthia Rosenzweig et al. eds., 2011). ARC3 resulted from the work of over 100 members of the UCCRN ARC3 writing team who represented more than 50 cities in developing and developed countries.

100. INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY § 8.4 (2014).

101. Miller, *supra* note 42, at 215.

102. See Nolon, *supra* note 28, at 549; see also Herzog & Hecht, *supra* note 7, at 466–67; Jessica Grannis et al., *Coastal Management in the Face of Rising Seas: Legal Strategies for Connecticut*, 5 SEA GRANT L. & POL'Y J. 59, 61 (2012).

103. Herzog & Hecht, *supra* note 7, at 472.

104. *Id.* at 472–73; but see *id.* at 473 (discussing high economic, environmental, and social costs of hard armoring).

105. See Nolon, *supra* note 28, at 549.

106. Herzog & Hecht, *supra* note 7, at 476 (footnotes omitted).

107. *Id.* at 475–76; see also FED. EMERGENCY MGMT. AGENCY, PR-RA2, SITING, DESIGN, AND CONSTRUCTION IN COASTAL FLOOD ZONES 2–3 (2018).

108. See Miller, *supra* note 42, at 240–41. The Firewise Communities program, which is administered by the nongovernmental National Fire Protection Association, is "a program for communities that focuses upon establishing a vegetation plan for the community that is fire-resistant, ensuring an ongoing presence of fire awareness in the community, and ensuring maintenance of the vegetation plan and development in the community over time." *Id.* at 250.

from wildfire, including, for example, the use of non-flammable roofing and the use of islands of vegetation surrounded by rock or brick retaining walls.¹⁰⁹

Accommodation strategies may be appropriate for residential and commercial areas that can sustain additional development if that development is designed for resilience.¹¹⁰ However, even when new development can be designed for structural resilience, communities must also consider other variables, including the economic and social costs of placing people in harm's way, cost of infrastructure maintenance in such areas, impact of new development on adjacent areas, loss of biodiversity, and lost opportunities to make or preserve space for natural ecosystems.¹¹¹

Retreat refers to shifting development out of vulnerable areas, which thereby moves people and structures out of harm's way and makes or preserves space for ecosystems.¹¹² Although retreat is often thought of in terms of a total cessation of development,¹¹³ retreat can involve continued albeit less intense land uses.¹¹⁴ Indeed, a broad range of retreat mechanisms can be facilitated through land use controls.¹¹⁵ These land use strategies may facilitate total retreat through, for example, the use of condemnation,¹¹⁶ rolling easements,¹¹⁷ or voluntary transfers of property

109. *Id.* at 240–41.

110. Herzog & Hecht, *supra* note 7, at 476.

111. See Siders, *supra* note 52, at 65 (reporting that presence of hard structures on shore can accelerate beach erosion, increase erosion on adjacent properties, and harm coastal ecosystems); *id.* at 103 (discussing conservation easements as tool to protect ecosystems, wildlife habitat, biodiversity, or open space); Grannis et al., *supra* note 102, at 78, n.95 (discussing threat to emergency personnel and adjacent areas); Jonathan Rosenbloom, *Fifty Shades of Gray Infrastructure: Land Use and the Failure to Create Resilient Cities*, 93 WASH. L. REV. 317, 328, 365–66 (2018) (discussing challenges climate change risks pose to infrastructure, and proposing that ecosystem services management and adaptive governance can be used to help create more resilient communities). See also *Gove v. Zoning Bd. of Appeals*, 831 N.E.2d 865, 871–75 (Mass. 2005) (rejecting a takings challenge to regulation prohibiting development in 100-year floodplain because development posed risks to adjacent parcels during flood events and to rescue personnel during evacuations).

112. James G. Titus et al., *State and Local Governments Plan Development of Most Land Vulnerable to Rising Sea Level Along the US Atlantic Coast*, 4 *Env'tl. Res. Letters* 044008, at 2 (2009).

113. Nolon, *supra* note 28, at 549.

114. See generally SIDERS, *supra* note 52; JESSICA GRANNIS, ADAPTATION TOOL KIT: SEA LEVEL RISE AND COASTAL LAND USE 16–44 (2011).

115. See generally Salkin, *supra* note 47, at 10162–69; SIDERS, *supra* note 52, at 5–7 (providing a table of legal and policy tools for promoting retreat); GRANNIS, *supra* note 114, at 16–44 (discussing planning and regulatory retreat strategies); J. Peter Byrne & Jessica Grannis, *Coastal Retreat Measures*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS* (Michael Gerrard & Katrina Kuh, eds., 2012).

116. See generally SIDERS, *supra* note 52, at 128–29 (discussing condemnation and condemnation with a conditional leaseback option as retreat tools); see also *Kelo v. City of New London*, 545 U.S. 469, 481 (2005) (government can acquire properties using eminent domain if the government pays the owner compensation and is pursuing a legitimate public purpose). Even after most state legislatures reacted to *Kelo* by limiting allowable public purposes under state law, flood control remains a legitimate public purpose in many states. See, e.g., Tex. Gov't Code Ann. § 2206.001(c) (West 2016) (allowing taking of private property for, among other things, flood control).

rights.¹¹⁸ They may facilitate a de-intensification of land uses through, for example, the use of transferrable development rights (TDRs) to encourage shifting of development from vulnerable areas to less vulnerable areas,¹¹⁹ or the adoption of local regulations that limit the use of the site.¹²⁰ Such local regulations may involve restrictions on building density or design,¹²¹ setback requirements,¹²² overlay zones,¹²³ subdivision regulations and cluster zoning,¹²⁴ or development moratoria to temporarily prohibit development or rebuilding in the wake of a disaster.¹²⁵

117. Rolling easements, which may be established through state legislation or municipal codes, generally prohibit development and require removal of pre-existing structures, including shore protection structures, seaward of a migrating boundary line, such as the dune vegetation line or mean high water line. JAMES G. TITUS, *ROLLING EASEMENTS* 3–5 (2011); *see also* SIDERS, *supra* note 52, at 41 (discussing use of rolling easements as a retreat tool).

118. As an alternative to exercising the power of eminent domain or mandatory development restrictions, the government can offer voluntary buyouts or help facilitate the acquisition of conservation easements. *See generally* SIDERS, *supra* note 52, at 103–06; *see also, e.g.*, JOHN COBURN & STEVEN R. LEWIS, *FLOODPLAIN PROTECTION INVENTORY FOR THE CARSON RIVER 3* (2015) (reporting that Carson City, Nevada’s Open Space Program has acquired hundreds of acres of property in the city’s floodplain since 2000 and The Nature Conservancy is negotiating conservation easements to protect other areas in the floodplain).

119. *See generally* GRANNIS, *supra* note 114, at 57–59 (discussing use of transferrable development credits as a retreat tool). Also known as “transferrable development rights” (TDRs), TDRs allow owners of land where development is not desirable to sell the development rights associated with that land to developers in areas where development is desirable. SIDERS, *supra* note 52, at 107; *see also* Rick Pruetz & Noah Standridge, *What Makes Transfer of Development Rights Work?*, 75 J. AM. PLAN. ASS’N 75, 78 (2009); Brion Blackwelder, *Presidential Executive Orders Duel Over Floodplain Definition as S.E. Florida Prepares for Sea Level Rise*, 29 FORDHAM ENVTL. L. REV. 156, 177 (2017) (noting examples of TDRs in flood-prone areas in Florida); Coburn & Lewis *supra* note 118 (reporting that Douglas County, Nevada has implemented a TDR program to encourage shifting of development from inside to outside the floodplain).

120. *See* GRANNIS, *supra* note 114, at 19–44 (discussing regulatory retreat tools).

121. *See, e.g.*, 06-096-355 ME. CODE R. §§ 1, 5(D) (LexisNexis 2018) (basing building size restrictions for certain structures on 100-year sea level rise projections).

122. Setbacks, which may be established through state legislation or municipal codes, are building restrictions that prohibit building a certain distance from a boundary line. SIDERS, *supra* note 52, at 41; *see, e.g.*, EAST HAMPTON, N.Y., CODE § 255-4-40 (2018) (imposing coastal setbacks of as much as 150 feet); *see also* SIDERS *supra* note 52 at 41–45 (discussing rolling setbacks); Herzog & Hecht, *supra* note 7, at 522–25 (discussing use of and legal limits on mandatory setbacks).

123. *See* Bacher, *supra* note 44, at 111–12 (analyzing essential components of and concerns regarding flood-protection overlay zone); *see, e.g.*, FLAGSTAFF, ARIZ., ZONING CODE, Div. 10-50.90, § 10-50.90.010(B) (2018) (imposing requirements in resource protection overlay zone to ensure protection of natural resources, including floodplains, and help “manage healthy and sustainable forests to reduce fire risk”); CLARK CTY., NEV., ZONING CODE §§ 30.48.280, 30.48.330(b)(1)–(2), (e)(1)(A)–(B) (2015) (providing Red Rock Design Overlay District achieving various purposes including preserving wildlife habitat by, amongst other things, restricting development on ridgelines, restricting grading, and imposing pre-determined building envelopes for lots surrounded by natural areas).

124. GRANNIS, *supra* note 114, at 34–35.

125. *See, e.g.*, DUCK, N.C., CODE OF ORDINANCES, 15 N.C. ADMIN. CODE ch.152 (2002) (stating that ordinance is intended to ensure rebuilding occurs “in an orderly manner” and with the oppor-

Other local tools for limiting land uses in vulnerable areas include permit exactions;¹²⁶ local building codes;¹²⁷ comprehensive, capital improvement, transportation, and open space plans;¹²⁸ floodplain, storm-water, and wetlands regulations;¹²⁹ and economic development plans.¹³⁰

Thus, local land use decision-making can directly affect how communities withstand climate-related risks.¹³¹ This, along with the capacity of local institutions to engage local stakeholders and networks,¹³² and the ability of local institutions to formulate place-specific strategies,¹³³ makes effective engagement of local governments critical to climate adaptation.

B. *The “Super Wicked” Problem of Local Climate Resilience Lawmaking*¹³⁴

Unfortunately, robust local government response to climate change risks remains unrealized.¹³⁵ Notwithstanding the magnitude of risks to coastal, riverine, WUI, and other vulnerable communities,¹³⁶ local land use policies in most localities have not changed or have shifted only incrementally with respect to hazard mitiga-

tunity to identify “appropriate areas for post-storm change and innovation”); *see also* Bacher, *supra* note 44, at 104 (discussing Town of Duck’s use of post-disaster building moratoria).

126. *See* Herzog & Hecht, *supra* note 7, at 526–27 (discussing California Coastal Act’s and California Environmental Quality Act’s authorization of certified local governments to impose “reasonable terms and conditions” on coastal development permits).

127. *See* Salkin, *supra* note 47, at 10158 (discussing national survey of public and private emergency managers, code specialists, and engineers that found building codes and land use planning ranked as the most effective tool to achieve hazards vulnerability reduction).

128. *See, e.g.,* Bacher, *supra* note 44, at 103 (discussing consideration of sea level rise in City of Bainbridge Island’s comprehensive plan).

129. *See, e.g.,* FALMOUTH, MASS., FALMOUTH WETLANDS REGULATIONS § 10.38(1) (2014) (requiring structures in flood zones to incorporate a relative sea level rise of one or two feet per 100 years, depending on the type of flood zone).

130. *See generally* Salkin, *supra* note 47, at 10162–69.

131. *See id.* at 10159; *supra* notes 94–103, 117–132 and accompanying text.

132. *Supra* notes 77–87 and accompanying text.

133. *Supra* notes 72–75 and accompanying text.

134. This section borrows from and builds on a chapter that I wrote on the super wicked nature of waterfront hazard mitigation planning. *See* Adams-Schoen, *supra* note 32, at 123–41.

135. A 2011 survey by Massachusetts Institute of Technology and ICLEI-Local Governments for Sustainability showed U.S. municipalities lagging behind their international counterparts in terms of climate change adaptation planning. CARMIN ET AL., *supra* note 24, at 10 (showing only 13% of the U.S. cities surveyed had completed an assessment of their vulnerabilities and risks, the lowest percentage of all regions surveyed). This troubling data is echoed by observations throughout the resilience and land use literature. *See also supra* notes 21–26.

136. *See* IPCC, 2014 *Summary for Policymakers, in* CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY PART A: GLOBAL AND SECTORAL ASPECTS. CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 6 (Field et al. ed., Cambridge Univ. Press 2014) (listing numerous potentially catastrophic risks consistent with the gap between vulnerability and local preparedness).

tion.¹³⁷ Ultimately, in municipalities throughout the United States—both large¹³⁸ and small¹³⁹—various intractable technical and socio-political obstacles continue to stymie resilience lawmaking at the local level.¹⁴⁰ In this context, technical challenges are challenges related to science, engineering, planning, and legal considerations.¹⁴¹ Socio-political challenges are challenges related to political, social, and psychological or cognitive considerations “such as tradeoffs among interests, values and beliefs”¹⁴² and irrational discounting of risks.¹⁴³ Thus, although many local governments have the authority and tools to increase disaster resilience,¹⁴⁴ local governments are not using their authority and tools to facilitate truly robust adaptation.

In essence, communities are doubling down on development, even in the face of known risks. Some are adopting protection and accommodation strategies, but few are adopting retreat strategies even where appropriate.¹⁴⁵ This is especially

137. Linda Shi et al., *Explaining Progress in Climate Adaptation Planning Across U.S.*, 81 J. AM. PLAN. ASS'N 191, 191 (2015) (study of 156 U.S. cities finding that, although 60% had engaged in some adaptation planning, only 9% had reached the implementation stage); *but see id.* at 195–96 (noting potential bias in survey from larger, wealthier, and more environmentally progressive cities being overrepresented in the sample); JUDD SCHECHTMAN & MICHAEL BRADY, *COST-EFFICIENT CLIMATE CHANGE ADAPTATION IN THE NORTH ATLANTIC* 6 (2013) (finding retreat accounted for 3% of adaptation projects, making retreat “the rarest type of adaptation” found in the study).

138. A 2011 survey conducted by ICLEI and MIT showed U.S. municipalities lagging behind their international counterparts in terms of climate change adaptation planning. CARMIN ET AL., *supra* note 24, at 14 (showing only 13% of the U.S. cities surveyed had completed an assessment of their vulnerabilities and risks, the lowest of all regions surveyed). This troubling data is echoed by observations throughout the resiliency and land use literature that local governments in the United States have yet to undertake robust adaptation planning and related lawmaking. *See, e.g.*, Herzog & Hecht, *supra* note 7, at 471 (reporting that California’s largest cities have begun to plan for sea level rise, but “[m]any of Southern California’s forty-four coastal county and municipal governments have not yet begun to think about sea level rise in a coordinated and targeted manner”).

139. *See generally* Stephen R. Miller, *The Local Official and Climate Change*, in *CONTEMPORARY ISSUES IN CLIMATE CHANGE LAW AND POLICY: ESSAYS INSPIRED BY THE IPCC 105* (Robin Kundis Craig & Stephen R. Miller eds., 2016) (discussing governance issues facing rural communities and rapidly growing urban areas).

140. *See generally* Danya Rumore, *Assessing the Social Landscape, Understanding the Readiness Challenge*, in *MANAGING CLIMATE RISKS IN COASTAL COMMUNITIES: STRATEGIES FOR ENGAGEMENT, READINESS AND ADAPTATION* 21 (Lawrence Susskind et al. eds., 2015) (presenting findings of study examining technical and socio-political barriers to adaptation).

141. *See id.* (identifying technical challenges as those related to science, engineering, and planning); *see also infra* Part II.B.3. (discussing legal challenges) and notes 343–48 and accompanying text (discussing technical challenges, including legal challenges).

142. Rumore, *supra* note 140, at 22.

143. *See infra* Part II.B.4.

144. *See infra* Part II.A.

145. *See* Bacher, *supra* note 44 at 103.

true of high-value areas, like many waterfronts and parts of the WUI.¹⁴⁶ But, retreat remains a dirty word in areas with low property values as well.¹⁴⁷

Given the ever-widening preparedness gap, framing local adaptation planning and lawmaking as a “super wicked” problem may help guide municipalities toward more effective strategies. In 1973, design and urban planning scholars Horst Rittel and Melvin Webber popularized the term “wicked” to describe social planning problems that cannot be successfully resolved with traditional linear analytical approaches.¹⁴⁸ Rittel and Webber described the wicked problems as difficult to define, not entirely solvable, socially complex, and characterized by interdependencies that can result in conflicting goals for the various stakeholders.¹⁴⁹ Rittel and Weber argued that current modes of policy analysis promote rather than solve these complex problems, such that proposed solutions to wicked problems often turn out to be worse than the initial problems.¹⁵⁰

However, as Kelly Levin later observed, “[w]hile Rittel and Webber usefully highlight features of problems that decision makers ought to consider when determining which decision tool to apply, wicked problems arguably describe most policy problems.”¹⁵¹ Thus, in 2007, Levin introduced the term “super wicked” to describe particularly intractable problems, like anthropogenic climate change.¹⁵²

146. Adams-Schoen, *supra* note 32, at 123–34.

147. See Lemann, *supra* note 45, at 442–44 (discussing resistance to retreat in post-Katrina New Orleans).

148. Horst W.J. Rittel & Melvin M. Webber, *Dilemmas in a General Theory of Planning*, 4 POL’Y SCI. 155, 160–69 (1973). Although Rittel and Webber’s 1973 paper is known for introducing the wicked problem terminology, it appears Rittel actually introduced the terminology at a seminar at University of California at Berkeley in 1967. See C. West Churchman, Guest Editorial, *Wicked Problems*, 14 MGMT. SCI. 141, 141 (1967).

149. Rittel & Webber, *supra* note 148, at 161–64 (identifying the following 10 characteristics of wicked problems: (1) no definitive definition; (2) characterized by a “no stopping rule” resulting from cascading consequences that are difficult to discern at the outset; (3) solutions are “not true-or-false,” but better or worse; (4) “no immediate and no ultimate test of a solution”; (5) “every solution . . . is a ‘one-shot operation,’” which means that, because “there is no opportunity to learn from trial-and-error, every attempt counts significantly”; (6) “wicked problems do not have an enumerable (or an exhaustively describable) set of potential solutions, nor is there a well-described list of permissible operations that may be incorporated into the plan”; (7) “every wicked problem is essentially unique”; (8) “every wicked problem can be considered as a symptom of another problem”; (9) “the existence of a discrepancy in describing a wicked problem can be explained in numerous ways[;] the choice of explanation determines the nature of the problem’s resolution”; (10) “the planner has no right to be wrong.”). See also Chris Riedy, *Climate Change Is a Super Wicked Problem*, PLANETCENTRIC (May 29, 2013), <http://chrisriedy.me/2013/05/29/climate-change-is-a-super-wicked-problem/> (summarizing modern understanding of characteristics of wicked problems).

150. Churchman, *supra* note 148, at 141.

151. Kelly Levin et al., *Overcoming the Tragedy of Super Wicked Problems: Constraining Our Future Selves to Ameliorate Global Climate Change*, 45 POL’Y SCI. 123, 126 (2012).

152. Kelly Levin, Steven Bernstein, Benjamin Cashore, & Graeme Auld first identified climate change as a super wicked problem in a conference paper in 2007. See Kelly Levin et al., *Playing It Forward: Path Dependency, Progressive Incrementalism, and the “Super Wicked” Problem of Global Climate*

Levin argued that these problems are characterized by the key features of wicked problems¹⁵³ plus four additional features: (1) time is running out, (2) those who cause the problem also seek to provide a solution, (3) the central authority needed to address the problem is weak or non-existent, and (4) irrational discounting occurs that pushes responses into the future.¹⁵⁴ Levin posited that these features in concert “create a tragedy because our governance institutions, and the policies they generate (or fail to generate), largely respond to short-term time horizons even when the catastrophic implications of doing so are far greater than any real or perceived benefits of inaction.”¹⁵⁵

Floodplain and WUI resilience planning and lawmaking embody the wicked and super wicked attributes.¹⁵⁶ Climate-related risks threatening these communities have multiple causal factors,¹⁵⁷ and thus, high levels of disagreement exist about the nature of the risks and their potential solutions.¹⁵⁸ Further, the motivation and behavior of individuals is a key part of any solution.¹⁵⁹ Resilience planning and lawmaking, especially with respect to flood prone areas and the WUI, also embodies the four additional “super wicked” attributes.¹⁶⁰

1. Time Is Running Out

Infrastructure lock-in and increasing risk levels over time mean time is not costless. The U.S. population is expected to grow to 420 million by 2050, and, between 2007 and 2050, 89 million new or replaced homes and 190 billion square feet

Change (Working Paper, June 3, 2010); see also Levin et al., *supra* note 151; Richard J. Lazarus, *Super Wicked Problems and Climate Change: Restraining the Present to Liberate the Future*, 94 CORNELL L. REV. 1153, 1161–87 (2009) (asserting that national climate change legislation presents a super wicked problem as a result of the nature of climate change itself, human nature, and the nature of U.S. lawmaking institutions).

153. Rittel & Webber, *supra* note 148, at 161–64 (identifying ten characteristics of wicked problems, including the problems are difficult to define, not entirely solvable, socially complex, and characterized by interdependencies that can result in conflicting goals for the various stakeholders).

154. See Levin et al., *supra* note 152, at 5–8.

155. Levin et al., *supra* note 151, at 124.

156. This is not to say that waterfront hazard mitigation in the context of a changing climate embodies all the characteristics that make anthropogenic climate change a super wicked problem.

157. See, e.g., CITY OF N.Y., 2014 NEW YORK CITY HAZARD MITIGATION PLAN 47–48 (2014), https://www1.nyc.gov/assets/em/downloads/pdf/hazard_mitigation/plan_update_2014/final_nyc_hmp.pdf. The climate-related risks threatening these communities have multiple causal factors, including, for floodplains, storms, floods, land subsidence, erosion, dam failure, landslides, building collapse, infrastructure failure, utility disruptions and disease outbreak.

158. See, e.g., Niki L. Pace, *Wetlands or Seawalls? Adapting Shoreline Regulation to Address Sea Level Rise and Wetland Preservation in the Gulf of Mexico*, 26 J. LAND USE & ENVTL. L. 327, 329 (2011).

159. See *infra* Part II.B.2.

160. See Jamison E. Colburn, *Retreat Alternatives in NEPA: A Tool for the Perplexed*, 33 J. ENVTL. L. & LITIG. 3, 28 (2018) (“land use planning in the WUI has become a ‘wicked’ problem”); Adams-Schoen, *supra* note 32, at 126–34.

of nonresidential buildings are projected to be constructed.¹⁶¹ The coastal population growth rate in the United States is more than double the national growth rate.¹⁶² PricewaterhouseCoopers reported in 1999 that the number of structures in the Special Flood Hazard Area (SFHA)—the area designated on FEMA’s Flood Insurance Rate Maps as subject to inundation during a one-percent annual chance flood (commonly known as a “one hundred-year flood”)¹⁶³—was projected to increase from the 6.6 million estimated in 1997 to 8.7 million in 2022.¹⁶⁴ However, the results of a 2012 study by the Association of State Floodplain Managers already showed approximately 8.6 million housing units in the SFHA.¹⁶⁵ Demographic migration trends in the West also show new development of flood hazard areas not covered by the National Flood Insurance Program, such as development on or near alluvial fans, moveable stream beds, and other arid-region flood hazards.¹⁶⁶ FEMA reports that “[t]he commercial and government infrastructure to support [homes in these areas] has followed [this development] and has subsequently become exposed to flood damage.”¹⁶⁷

With respect to the WUI, studies also project rapid development of the Western and Southeastern WUI.¹⁶⁸ Along the West Coast and in the Mountain West,

161. REID EWING ET AL., *GROWING COOLER: EVIDENCE ON URBAN DEVELOPMENT AND CLIMATE CHANGE* 8 (2008).

162. Matthew E. Hauer et al., *Millions Projected to be at Risk from Sea-level Rise in the Continental United States*, 6 *NATURE CLIMATE CHANGE* 691, 691 (2016).

163. FRENCH WETMORE ET AL., *AM. INST. FOR RESEARCH, THE EVALUATION OF THE NATIONAL FLOOD INSURANCE PROGRAM FINAL REPORT* 6 (2006) [hereinafter *NFIP EVALUATION REPORT*].

164. PRICEWATERHOUSECOOPERS, *STUDY OF THE ECONOMIC EFFECTS OF CHARGING ACTUARIAL-BASED PREMIUM RATES FOR PRE-FIRM STRUCTURES*, at 2-1-5 (1999).

165. NAT’L RESEARCH COUNCIL, *LEVEES AND THE NATIONAL FLOOD INSURANCE PROGRAM: IMPROVING POLICIES AND PRACTICES* 13 (2013).

166. *NFIP EVALUATION REPORT*, *supra* note 163, at 9.

167. *Id.*

168. Roger B. Hammer, *Demographic Trends, the Wildland-Urban Interface, and Wildlife Management*, 22 *SOC’Y & NAT. RES.* 777, 779 (2009):

If the relationship between new housing unit construction and additional housing units in the WUI remains unchanged, between 2000 and 2030 there will be an additional 12.3 million WUI units in the West and an additional 4.6 million in the Southeast, representing 111% growth in the West and 93% growth in the Southeast.

Id.

HEADWATERS ECON., *SOLUTIONS TO THE RISING COSTS OF FIGHTING FIRES IN THE WILDLAND URBAN INTERFACE* 5 (2009), <http://headwaterseconomics.org/wphw/wp-content/uploads/HeadwatersFireCosts.pdf> (“Perhaps the most relevant characteristic of the WUI is its potential for growth. Only 14 percent of forested western private land adjacent to public land is currently developed for residential use, leaving tremendous potential for future development on the remaining 86 percent.”); *id.* at 3 (“Although the cost of protecting homes from wildfires in recent years has been alarming, policy makers and land managers should be aware that these costs will grow significantly as development and warming trends continue.”).

“the WUI is almost universally the fastest growing zone of residential land development, at the expense of open space and wildlife habitat.”¹⁶⁹ This continued, rapid development of the WUI is driven by the deconcentration of housing, population growth, and interregional population migration,¹⁷⁰ trends that will likely be exacerbated by the retirement of baby boomers.¹⁷¹ Additionally, some of the most rapid WUI residential development is happening in some of the most fire-prone areas.¹⁷² Thus, absent policies that limit development in flood-prone areas and the WUI, we can anticipate significant new development in these areas. This new development, coupled with increased flood, fire, and related risks means time is far from costless.

2. Those Who Seek to Provide Solution Also Cause the Problem

Those who seek to end the problem of increased floodplain and WUI risks also contribute to the problem. This is true from the federal government scale down to the individual homeowner scale.¹⁷³

Federal regulation of flood areas and the WUI is characterized by partial solutions, some of which have the effect of increasing, rather than decreasing, vulnerability. The NFIP is widely criticized for perversely incentivizing development and rebuilding in flood-prone areas,¹⁷⁴ notwithstanding that aspects of the program have increased community- and building-scale resilience.¹⁷⁵ Jamison Colburn argues that the NFIP “convey[s] a sense of security and federal approval,” and has therefore “probably increased our vulnerability to floods in the U.S. by normaliz-

169. Lloyd Burton, *In Dubious Battle: The Human Cost of Wildland Firefighting*, 33 J. ENVTL. L. & LITIG. 87, 91 (2018).

170. Hammer et al., *supra* note 168, at 778–80.

171. *Id.* at 779–80 (describing contribution of baby boomer demographics to WUI growth).

172. N. Research Station, *New Analyses Reveal WUI Growth in the U.S.*, U.S. FOREST SERV., <https://www.nrs.fs.fed.us/data/wui/> (last modified Feb. 16, 2018).

173. See *infra* notes 177–90 and accompanying text (discussing federal government scale); see *infra* notes 191–96 and accompanying text (discussing municipal government scale); see *infra* notes 197–98 and accompanying text (discussing individual homeowner scale).

174. See, e.g., Robin Kundis Craig, *Harvey, Irma, and the NFIP: Did the 2017 Hurricane Season Matter to Flood Insurance Reauthorization?*, 40 U. ARK. LITTLE ROCK L. REV. (forthcoming 2018); Edward P. Richards, *Applying Life Insurance Principles to Coastal Property Insurance to Incentivize Adaptation to Climate Change*, 43 BOSTON COLL. ENVTL. AFFAIRS L. REV. 427, 428 (2016).

175. See, e.g., NFIP EVALUATION REPORT, *supra* note 163, at 16 (reporting that NFIP requirement that covered communities meet certain minimum building standards has resulted in loss reductions); see also *id.* at 14 (reporting that in 2005 over 1,000 communities participated in the Community Rating System, a voluntary program established by the NFIP that provides premium discounts for policyholders in communities that implement floodplain management activities that exceed the minimum requirements of the NFIP); Carolyn Kousky & Erwann Michel-Kerjan, *Examining Flood Insurance Claims in the United States: Six Key Findings*, 84 J. RISK & INS. 819, 837 (2017) (empirical analysis finding that claims in communities that participate in the CRS are lower than in non-participating communities).

ing and thereby enabling flood plain development—which has risen steadily every year since 1968.”¹⁷⁶ This maladaptive pattern may stem from the NFIP’s focus on accommodation over retreat.¹⁷⁷ Although “guiding development away” from flood hazards is a stated goal of the NFIP, the program focuses almost exclusively on accommodating development in flood hazard areas.¹⁷⁸

Colburn draws a parallel between the NFIP and the Healthy Forests Restoration Act of 2003 (HFRA),¹⁷⁹ arguing that both have had the effect of enhancing vulnerabilities rather than reducing risk.¹⁸⁰ HFRA prioritizes fuel treatments—which are the reduction of “fuels” that have built up in forests, including dried grasses, bushes, and woody debris¹⁸¹—in the WUI to reduce the severity of fires by requiring that at least 50% the funds allocated for fuel reduction projects be spent in the WUI.¹⁸² But, like the NFIP, HFRA has the effect of “encourage[ing] landowners to build their homes in harm’s way, encourag[ing] communities to invest in more wildland sprawl, and increas[ing] the risks firefighters must face in trying to contain wildfire.”¹⁸³ Similar to criticisms leveled at the NFIP’s cost-shifting function,¹⁸⁴ modeling by economists Gwenlyn Busby and Heidi Albers concluded that federal wildfire policy, which provides for public funding of fuel treatments, encourages maladaptive behavior by private landowners in the WUI.¹⁸⁵

Conflicting messages from stakeholders committed to increasing resilience also illustrate the super wicked nature of the problem presented by development in the context of a changing climate. For example, a report on achieving hazard-resilient coastal communities published by NOAA and the EPA encourages re-

176. Jamison Colburn, *The Fire Next Time: Land Use Planning in the Wildland/Urban Interface*, 28 J. LAND, RESOURCES, & ENVTL. L. 223, 242–43 (2008); see also Craig, *supra* note 174, at 40 (criticizing the NFIP for incentivizing development of the floodplains and coasts).

177. NFIP EVALUATION REPORT, *supra* note 163, at 12–20; see also *infra* notes 75–82 and accompanying text (discussing accommodation and retreat strategies, which the report refers to as vertical and horizontal protection techniques).

178. NFIP EVALUATION REPORT, *supra* note 163, at 12–16 (evaluating program’s two limited retreat (or horizontal) provisions); *id.* at 14 (concluding that, “[a]lthough these two provisions prevent much development in very small parts of coastal floodplains and in mapped floodways, the NFIP has no other regulatory provisions for keeping floodplains clear, even in high hazard areas”); see also *id.* at 23 (discussing other drivers of maladaptive development and rebuilding); GOV’T ACCOUNTABILITY OFFICE, GAO-16-59, NATIONAL FLOOD INSURANCE PROGRAM: CONTINUED PROGRESS NEEDED TO FULLY ADDRESS PRIOR GAO RECOMMENDATIONS ON RATE-SETTING METHODS 21 (2016).

179. 16 U.S.C. §§ 6501-6591(2012).

180. Colburn *supra* note 176, at 242–43.

181. Gwenlyn Busby & Heidi J. Albers, *Wildfire Risk Management on a Landscape with Public and Private Ownership: Who Pays for Protection?*, 45 ENVTL. MGMT. 296, 296 (2010).

182. 16 U.S.C. § 6513(d)(1)(A) (2012).

183. Colburn *supra* note 176, at 224.

184. See *supra* note 174 and accompanying text.

185. See Busby & Albers, *supra* note 181, at 307-08 (game theoretic analysis concluding that public liability to protect private values in WUIs encourages private landowners to do too little fuel treatments).

building in coastal areas, albeit with design and siting decisions based on smart growth principles.¹⁸⁶ The report's ten "smart growth and hazard mitigation strategies specifically for coastal and waterfront communities" do not include any suggestion that waterfront development be restricted or limited and only one strategy that would have this effect,¹⁸⁷ despite recognition that "[i]nfill development may increase risk if existing development is in a hazard-prone location" and "[k]eeping development out of flood-prone areas protects lives and property and allows alternative uses of the land, such as public waterfront parks and recreation areas."¹⁸⁸

Solutions that only partially ameliorate, but also compound, the problem abound at the municipal level as well. For example, following Hurricane Sandy, some waterfront municipalities amended their zoning or building codes to increase resilience by imposing requirements that made structures more flood-proof.¹⁸⁹ However, by facilitating development and redevelopment of vulnerable areas, these resilience amendments also encouraged intensification of land uses, increased population density, increased impermeable surfaces, and siting of critical infrastructure in high-risk areas, all of which tend to increase flood risk.¹⁹⁰

Even municipalities that have adopted otherwise robust adaptation policies emphasize accommodation over retreat, thus encouraging development and rede-

186. NAT'L OCEANIC & ATMOSPHERIC ADMIN., ENVTL. PROT. AGENCY, ACHIEVING HAZARD-RESILIENT COASTAL & WATERFRONT SMART GROWTH: COASTAL AND WATERFRONT SMART GROWTH AND HAZARD MITIGATION ROUNDTABLE REPORT 6 (2013). Strategy three is to "[p]rovide a range of housing opportunities and choices to meet the needs of both seasonal and permanent residents" and strategy seven is to "[s]trengthen and direct development toward existing communities, and encourage waterfront revitalization." *Id.*

187. Strategy six is to "[p]reserve open space, farmland, natural beauty, and the critical environmental areas that characterize and support coastal and waterfront communities." *Id.* at 6.

188. *Id.* at 8.

189. See, e.g., N.Y.C. BUILDING CODE, app. G, § 304.1.1 (2014) (requiring 1–2 family residences be flood-proofed to 2 feet above Base Flood Elevation); *id.* § 302.1.1 (requiring 30 feet of ramp for a 30-inch rise); FREEPORT, N.Y. CODE § 87–16(D)(1)(a) & (E)(1)(a) (1997) (requiring that equipment maintained by substantially damaged utilities, residential and non-residential structures located in certain flood zones be "elevated to a minimum of four feet above the base flood elevation or two feet above the New York State freeboard requirement, whichever is greater."). The "base flood elevation" (BFE) is the elevation shown on the Flood Insurance Rate Map for A- and V-zones that indicates the water surface elevation resulting from a 100-year flood, also known as "the base flood." EMILY MAUS, CASE STUDIES IN FLOODPLAIN REGULATION: CHALLENGES AND OPPORTUNITIES IN PREPARING FOR CLIMATE CHANGE 13 (2013). A requirement that a structure be built so that its lowest floor is above the BFE is a "freeboard" requirement. JUSTIN GUNDLACH & P. DANE WARREN, LOCAL LAW PROVISIONS FOR CLIMATE CHANGE ADAPTATION 13 (2016). Freeboard requirements in municipalities in New York, with the exception of New York City, are set by the statewide Uniform Fire Prevention and Building Code. *Id.* Freeport applied for and received an exception to these rules. *Id.*

190. See CITY OF N.Y., DEP'T OF CITY PLANNING, COASTAL CLIMATE RESILIENCY: RETROFITTING BUILDINGS FOR FLOOD RISK 40, 42–43 (2014) (depending on amount of stairs or ramping required to access elevated structures, the structure may need to be shifted into space that had been the backyard, and additional stairs and ramping are often located in the space that had been the front yard); OR. DEP'T OF LAND CONSERVATION, WATER QUALITY MODEL CODE AND GUIDE BOOK 4.44 (2000) (discussing disruptions caused by building impervious surfaces in floodplains).

velopment in vulnerable areas.¹⁹¹ For example, New York City, which has been widely applauded for its comprehensive approach to climate change mitigation and adaptation,¹⁹² nevertheless eschews retreat and instead boasts about continued development of waterfront areas. For example, the city reported in its Clean Waterfront Plan that “New Yorkers are taking advantage of the waterfront for recreation, housing, and new business opportunities in record numbers.”¹⁹³ In its coastal management plan, the city reported that:

New housing on waterfront property has helped the city accommodate the influx of nearly one million new residents. Since 1992, [when the City adopted its first waterfront plan,] more than 20,000 new residential units have been built on waterfront blocks, with nearly 6,000 additional new units in the development pipeline.¹⁹⁴

At the scale of the individual property owner, owners often take actions that increase the risks that threaten their properties. For example, many waterfront property owners use hard armoring to protect their property from erosion and flood risks,¹⁹⁵ even when this armoring leads to the “unintended . . . consequences [of] vertical erosion, loss of downdrift sediment, and erosion of flanking shores.”¹⁹⁶

3. The Central Authority Needed to Address the Problem Is Weak

Authority over hazard mitigation in flood-prone communities and the WUI is fragmented and diffuse. With respect to coastal area hazard mitigation in particular, a complex web of more than a dozen local, state, and federal laws implemented by an even greater number of agencies, departments, commissions, and task forces creates a policy regime that epitomizes fragmentation.¹⁹⁷ Similarly, regulation of

191. *But see* PORT JEFFERSON, N.Y., CODE § 111 (2013) (prohibiting construction in erosion control hazard area unless construction satisfies coastal erosion management permitting requirements).

192. *See, e.g.*, Rachel Dovey, *New York City Issues Ambitious Climate Action Plan*, NEXTCITY (June 12, 2017), <https://nextcity.org/daily/entry/new-york-city-issues-ambitious-climate-action-plan>; Oliver Milman et al., *The Fight Against Climate Change: Four Cities Leading the Way in the Trump Era*, THE GUARDIAN (June 12, 2017), <https://www.theguardian.com/cities/2017/jun/12/climate-change-trump-new-york-city-san-francisco-houston-miami>; *see also* Adams-Schoen, *supra* note 32 (describing New York City’s climate change mitigation and adaptation laws and policies).

193. CITY OF N.Y., MAYOR’S OFFICE OF LONG-TERM PLANNING AND SUSTAINABILITY, NYC LOCAL LAW 55 OF 2011: CLEAN WATERFRONT PLAN 4 (2014).

194. CITY OF N.Y., DEP’T OF CITY PLANNING, VISION 2020: NEW YORK CITY COMPREHENSIVE WATERFRONT PLAN 13 (Mar. 2011) [hereinafter VISION 2020].

195. Scott L. Douglass & Bradley H. Pickel, *The Tide Doesn’t Go Out Anymore: The Effect of Bulkheads on Urban Bay Shorelines*, 67 SHORE & BEACH 19, 19 (1999).

196. LaDon Swann, *The Use of Living Shorelines to Mitigate the Effects of Storm Events on Dauphin Island, Alabama, USA*, AM. FISHERIES SOC’Y SYMP., 2008, at 2.

197. *See, e.g.*, The Coastal Zone Management Act, 16 U.S.C. § 1454 (2012), Submerged Lands Act of 1953, 43 U.S.C. § 1312 (2006); Coastal Barrier Resources Act, 16 U.S.C. § 1452(2)(K) (2006); New York State Waterfront Revitalization of Coastal Areas and Inland Waterways Act, N.Y. COMP.

fire risk on the public lands that about the WUI has been characterized as “an uncoordinated and fragmented welter of organic statutory provisions, environmental protection mandates, annual budget riders, site-specific legislation, judicial decisions, policy documents, management plans, and diverse state statutory provisions.”¹⁹⁸ The private lands of the WUI are also subject to overlapping federal, state, county, and local laws.¹⁹⁹ Additionally, land uses in both flood-prone areas and the WUI are typically also subject to state and local land use laws and building codes,²⁰⁰ the state’s common law and statutory public trust doctrine,²⁰¹ and federal takings jurisprudence.²⁰²

Floodplain and WUI policies tend to be scattered throughout numerous plans including local comprehensive plans; county and regional disaster mitigation plans; waterfront revitalization plans; and state, county, and local hazard mitigation

CODES R. & REGS. tit. 19, § 600.1(c) (2012); Tidal Wetlands Act (TWA), N.Y. COMP. CODES R. & REGS. tit. 6, § 661.1 (2012); New York Coastal Erosion Hazard Area Act (CEHA), N.Y. ENVTL. CONSERV. LAW § 34-0102(5) (McKinney 2012); N.Y.C. DEP’T OF CITY PLANNING, THE NEW WATERFRONT REVITALIZATION PROGRAM 3 (2002); CITY OF N.Y., DEP’T OF CITY PLANNING, CITY PLANNING COMM’N, ZONING RESOLUTION (Apr. 28, 2015). See also Sarah J. Adams-Schoen, *Sink or Swim: In Search of a Model for Coastal City Climate Resilience*, 40 COLUM. J. ENVTL. L. 433, 473–79 (discussing web of federal, state and local laws applicable to New York City waterfront).

198. Robert B. Keiter, *The Law of Fire: Reshaping Public Land Policy in an Era of Ecology and Litigation*, 36 ENVTL. L. 301, 303–04 (2006); see also Karen M. Bradshaw, *Backfired! Distorted Incentives in Wildfire Suppression Techniques*, 31 UTAH ENVTL. L. REV. 155, 157 (2011) (noting that state and federal agencies are primarily responsible for fighting wildfire, and, “[i]n practice, a variety of government fire-fighting forces often work together”).

199. In Oregon, for example, HFRA governs the definition of the WUI for purposes of federal funding of fire treatment in the WUI. See generally 16 U.S.C. § 6511(16) (2012) (defining the WUI); *id.* § 6513(d)(2) (2012) (governing funding of fire fuel reduction on non-federal lands). The Oregon State Department of Forestry is responsible for wildfire management in the WUI. OR. REV. STAT. § 477.005 (2017) (describing the Oregon State Department of Forestry’s policy of fire prevention and suppression). The Department of Forestry relies on county-appointed committees to define the areas that make up the interface. *Id.* §§ 477.029, 477.031. State law mandates certain individual property owner mitigation. *Id.* § 477.059(1)(a), (6). Local governments can make land designations, but state law does not delegate enforcement power to local governments. See *id.* §§ 477.001–477.993 (including no delegation of authority to local police to enforce its provisions). The Department of Forestry has enforcement authority with respect to non-compliant local governments and individual property owners. *Id.* § 477.057(1) (enabling the State Forester to classify forestland-urban interface territory if a local governing body fails to do so). See also Lloyd Burton, *In Dubious Battle: The Human Cost of Wildland Fire-fighting*, 33 J. ENVTL. L. & LITIG. 87, 102–03 (2018) (surveying Oregon’s approaches to WUI governance).

200. Miller, *supra* note 42, at 211–12 (“[l]ocal governments retain authority to approve WUI development through applications of local zoning, building, fire, and subdivision codes”); Salkin, *supra* note 47, at 10159 (“local governments maintain day-to-day responsibility and control over the use of the vast majority of lands that abut the nation’s edge and other environmentally sensitive areas”).

201. See, e.g., N.Y. PUB. LANDS LAW § 75 (McKinney 2014).

202. See, e.g., *Paoella v. City of New York*, 197 N.Y.S. 2d 447, 451 (N.Y. App. Div. 2014) (finding reasonable probability that city wetlands designation is a regulatory taking under federal constitution).

plans.²⁰³ In most jurisdictions, zoning laws must be consistent with a municipality's comprehensive plan,²⁰⁴ which may be interpreted to include all relevant planning activities.²⁰⁵ Similarly, local, state, and federal actions must be consistent with any local waterfront revitalization plan.²⁰⁶ However, notwithstanding these consistency requirements, the numerous plans setting forth the various land use and risk-reduction policies applicable to a community often fail to cross-reference one another, are developed by various planning authorities that may not collaborate with one another, and may contain conflicts.²⁰⁷ Additionally, as Stephen Miller recently observed, land uses in many rural communities are frequently governed more by informal institutions like social clubs and chambers of commerce than they are by local codes or plans.²⁰⁸

With respect to this fragmentation at the planning level, a roundtable of experts from the fields of smart growth, hazard mitigation, climate change adaptation, and coastal management stressed the need to link hazard mitigation and land use planning processes, further research the potential for one plan to serve multiple

203. See, e.g., CITY OF N.Y., PLANYC: A STRONGER, MORE RESILIENT NEW YORK 57–65 (2013) [hereinafter STRONGER, MORE RESILIENT] (setting forth 37 initiatives to increase resilience of city's waterfront); VISION 2020, *supra* note 194; CITY OF N.Y., DEP'T OF CITY PLANNING, THE NEW WATERFRONT REVITALIZATION PROGRAM 3 (2002); CITY OF N.Y., DEP'T OF CITY PLANNING, THE NEW YORK CITY WATERFRONT REVITALIZATION PROGRAM: NEW YORK CITY APPROVED REVISIONS PURSUANT TO SECTION 197-A OF THE CITY CHARTER (2016); CITY OF N. Y., 2014 NEW YORK CITY HAZARD MITIGATION PLAN (2014).

204. See 1 PATRICIA E. SALKIN, NEW YORK ZONING LAW & PRACTICE § 4:03 (4th ed., 2018) (reporting that enabling statutes in most states require zoning to be in accordance with the comprehensive plan); Edward J. Sullivan & Jennifer Bragar, *Recent Developments in Comprehensive Planning*, 46 URB. LAW. 685, 689–90 (2014) (reporting trends in case law toward the view that a comprehensive plan is at least a factor in judicial analysis of zoning law).

205. E.g., N.Y. TOWN LAW § 272-a(2)(a) (McKinney 2014) (defining comprehensive plan as “the materials, written and/or graphic, including but not limited to maps, charts, studies, resolutions, reports and other descriptive material that identify the goals, objectives, principles, guidelines, policies, standards, devices and instruments for the immediate and long-range protection, enhancement, growth and development of the” municipality).

206. 16 U.S.C. § 1456(c)(1)–(2) & (d) (2012); 15 C.F.R. pt. 930 (2015); see, e.g., 42 N.Y. EXEC. LAW § 916 (McKinney 2014) (requiring “state agency program actions be undertaken in a manner which is consistent to the maximum extent practicable with the approved [local] waterfront revitalization program [LWRP],” including reviews conducted under the state environmental quality review act”); N.Y. COMP. CODES R. & REGS. tit. 10, § 97.12(d)(13) (2015) (providing for state environmental impact review based on effects of proposed action on applicable policies of LWRP as opposed to state WRP when municipality has an approved LWRP).

207. See STRONGER, MORE RESILIENT, *supra* note 203, at 40 (concluding that “[e]fforts by [the multiple] agencies [with regulatory authority in the coastal zones] are not completely aligned” and “[t]his lack of unified and coordinated regulatory oversight can lead to delayed and unpredictable waterfront activity, complicating the achievement of important public goals, including coastal resiliency”).

208. Stephen R. Miller et al., *Informal Governance Structures and Disaster Planning: The Case of Wildfire*, 40 U. ARK. LITTLE ROCK L. REV. (forthcoming 2018) (discussing nongovernmental institutions in rural communities that frequently exercise greater control over land uses than the communities' local governments).

planning requirements, and provide tools and technical assistance to better integrate plans at the local level.²⁰⁹ In the meantime however, the existing fragmentation means that central authority over climate-related risks in flood-prone areas and the WUI remains weak or non-existent.

4. Irrational Discounting Pushes Responses into the Future

Adoption of accommodation-focused adaptation strategies and municipal messaging that deemphasizes the likelihood of disastrous wildfires or flooding promotes irrational discounting of climate-related risks and pushes adaptive responses into the future.²¹⁰ Although some resistance to retreat strategies may be based in emotional responses that “appropriately express the values that define [people’s] identities,”²¹¹ responses to risk—whether calculated or emotionally or culturally driven—are likely to discount climate-related threats when government actions and messaging convey that such threats are unlikely to occur, or can be accommodated.²¹²

The reward of risk mitigation is often perceived as ephemeral and the potential harms as unlikely to occur within the “lifespan” of a government.²¹³ One consequence of these perceptions is that elected officials may prefer to increase public support for actions that have immediate, visible effects, such as increasing the tax base through development of high-value coastal properties.²¹⁴ Additionally, planning departments may be motivated to please their “preferred customers,” the de-

209. NOAA, *ACHIEVING HAZARD-RESILIENT COASTAL & WATERFRONT SMART GROWTH: COASTAL AND WATERFRONT SMART GROWTH AND HAZARD MITIGATION ROUNDTABLE REPORT 11* (2013).

210. See Justin Pidot, *Deconstructing Disaster*, 2013 *BYU L. REV.* 213, 242–43 (2013) (A range of cognitive processes affect assessment of redevelopment in the wake of disaster and often “militate in favor of development even where such development is ‘irrational’ in the market sense that risks outweigh benefits.”); ASS’N OF STATE FLOODPLAIN MANAGERS, *NATIONAL FLOOD PROGRAMS & POLICIES IN REVIEW 33* (2015) (“Research shows that people think they (and their property) have little flood risk even though their community may have a risk of flooding.”); Adams-Schoen, *supra* note 197, at 466 n.185 (citing surveys and polls showing continued low levels of belief in anthropogenic climate change in the United States as compared with other countries).

211. Dan M. Kahan, *Two Conceptions of Emotion in Risk Regulation*, 156 *U. PA. L. REV.* 741, 748–49 (2008); see also Lemman, *supra* note 45, at 444 (asserting that resistance to retreat can be an expression of “commitment to community that may well be a fundamental aspect of self-identity”).

212. See Adams-Schoen, *supra* note 32, at 138–41; see also Kahan, *supra* note 211, at 764–65 (asserting that emotional evaluation of risk is subject to education and arguing that information must be framed in a way that expresses a plurality of social meanings).

213. See COLIN PRICE, *TIME, DISCOUNTING, AND VALUE 125* (1993) (“Although society may be regarded as immortal, a government achieving several terms in office still has a life-span shorter than that of an average human.”).

214. See JOHN R. LOGAN & HARVEY L. MOLOTOCH, *URBAN FORTUNES: THE POLITICAL ECONOMY OF PLACE 57–63* (1987) (describing municipal narratives of cost- and value-free growth and local political pressure for economic growth).

velopers who pay the fees that fund the department, because the departments' continued existence is dependent on development applications.²¹⁵ Adoption of adaptation strategies that emphasize accommodation, which can have the perverse effect of increasing the short-sightedness of the public, can help achieve these ends.²¹⁶ In this way, governments are both the cause and effect of the super wicked nature of the problem.²¹⁷

Municipal messaging can contribute to this perverse dynamic. Following Hurricane Sandy, state and local governments along the East Coast characterized the storm as “unthinkable,” “unique,” and the “worst case scenario.”²¹⁸ In addition to being factually incorrect,²¹⁹ such characterizations may lull constituents into believing another storm of the same or greater magnitude is highly unlikely—a belief that may contribute to local resistance to retreat.²²⁰ Additionally, by using themes of toughness and resistance in municipal messaging,²²¹ municipalities may contribute to the misperception that climate-related threats will not overwhelm adaptive technologies.²²²

215. Miller, *supra* note 139, at 116.

216. See *supra* notes 176–87 and accompanying text (discussing perverse consequences of NFIP and HFRA emphasis on accommodation, including promotion of maladaptive development).

217. See *supra* Part II.B.2.

218. See, e.g., Cavan Siczkowski, *Hurricane Sandy Damage Photos: Superstorm's 'Unthinkable' Aftermath Revealed*, HUFFINGTON POST (Oct. 30, 2012, 1:08 PM), http://www.huffingtonpost.com/2012/10/30/hurricane-sandy-damage-photos-superstorm-unthinkable-aftermath_n_2044099.html (“Chris Christie said the wreckage is ‘beyond anything I thought I’d ever see.’ Adding, ‘The level of devastation at the Jersey Shore is unthinkable,’ according to CNN.”); Michael R. Bloomberg, *Foreword*, in STRONGER, MORE RESILIENT, *supra* note 203 (referring to Sandy as “the worst natural disaster ever to hit New York City”).

219. See STRONGER, MORE RESILIENT, *supra* note 203, at 21 (reporting that, had Sandy struck at high tide in Western Long Island Sound, as opposed to near high tide in New York Harbor and along the Atlantic Ocean, modeling projects that Sandy’s peak surge would have been four feet higher than it was); see also Maxine Burkett, *Duty and Breach in an Era of Uncertainty: Local Government Liability for Failure to Adapt to Climate Change*, 20 GEO. MASON L. REV. 775, 782 n.46 (2013) (citing New York and New Jersey master plans and reports predicting the growing dangers from continued development); John Rudolf et al., *Hurricane Sandy Damage Amplified by Breakneck Development of Coast*, HUFFINGTON POST (Nov. 12, 2012, 12:15 PM), http://www.huffingtonpost.com/2012/11/12/hurricane-sandy-damage_n_2114525.html (reporting on Princeton University study published 8 years before Sandy that warned the rapid population growth in New Jersey’s “coastal counties was setting the scene for monumental environmental damage and property loss”).

220. See Pidot, *supra* note 210, at 242–43.

221. Adams-Schoen, *supra* note 32, at 133 (citing and quoting examples of municipal messaging using toughness themes).

222. See Robin Kundis Craig, *Learning to Live with the Trickster: Narrating Climate Change and the Value of Resilience Thinking*, 33 PACE ENVTL. L. REV. 351, 377–81 (2016) (discussing the “technology will save us” cultural narrative and tendency to adopt adaptation strategies that focus on human control).

So, why bother identifying problems as wicked or super wicked? The point certainly is not to “sit around and lament” the problems.²²³ Rather, the point is to “tame” them.²²⁴ The wicked and super wicked monikers prove useful insofar as they help inform responses to the problems.²²⁵ By identifying a problem as wicked or super wicked, lawmakers and analysts can recognize that the problem is “highly resistant to resolution,”²²⁶ avoid strategies that are known not to work with such problems, and explore strategies that do work with such problems.

II. STATE ADAPTATION LAWMAKING CASE STUDY: NEW YORK’S CLIMATE RESILIENCE LAW

The following discussion asks: What resources—broadly defined to include tools, information, incentives, and mandates—would help local governments overcome the super wicked climate resilience problem? Although federal law and policy could provide some of these resources,²²⁷ the discussion that follows focuses on “the state as a political and legal focal point in the system of local governments,”²²⁸ and concludes that state lawmaking can and should help local governments use local lawmaking authority to comprehensively and proactively adapt communities to climate- and weather-related risks.²²⁹

As one of only a small handful of state adaptation laws, New York’s recent Community Risk and Resiliency Act of 2014 (CRRA) provides a useful case study for examining how state lawmaking can help local governments overcome the governance challenges of adapting to climate-related risks. That said, a number of things limit the use of the New York state adaptation scheme as a model for other jurisdictions. First, the CRRA is limited in its scope to “future physical climate risk due to sea level rise, and/or storm surges and/or flooding,”²³⁰ and is not applicable in substance to wildfire or other climate-related risks. Many of the “lessons

223. Chris Riedy, *Climate Change Is a Super Wicked Problem*, PLANETCENTRIC (May 29, 2013), <http://chrisriedy.me/2013/05/29/climate-change-is-a-super-wicked-problem/>.

224. Rittel & Webber, *supra* note 148, at 160 (defining and contrasting wicked and tame problems); John C. Camillus, *Strategy as a Wicked Problem*, HARV. BUS. REV. ONLINE (May 2008), <https://hbr.org/2008/05/strategy-as-a-wicked-problem> (arguing that wicked problems cannot be solved but can be tamed).

225. See Levin et al., *supra* note 151, at 148 (discussing need to identify super wickedness in order to avoid attempted solutions that exacerbate the problem).

226. AUSTL. PUB. SERV. COMM’N, TACKLING WICKED PROBLEMS: A PUBLIC POLICY PERSPECTIVE, at iii (2007).

227. See Shannon M. Roesler, *Federalism and Local Environmental Regulation*, 48 U.C. DAVIS L. REV. 1111, 1155-63 (2015) (exploring potential for federal authority to be exercised in support of local laws); Nestor M. Davidson, *Cooperative Localism: Federal-Local Collaboration in an Era of State Sovereignty*, 93 VA. L. REV. 959, 966-75 (2007).

228. Briffault, *Our Localism I*, *supra* note 1, at 6.

229. See *infra* Part II.B.

230. 2014 N.Y. Laws 1115-18.

learned” from the CRRA are therefore solely or primarily applicable to flood-related risk regulation.²³¹ Second, New York is a home-rule state with a long tradition of recognizing local authority over a broad array of land uses,²³² and the CRRA’s adaptation scheme partially reflects this.²³³ Third, differences in geography, climate-related risks, state and substate laws, and state and substate governmental structures mean that wholesale adoption of the CRRA as a model would not be appropriate, even in states with a robust home rule tradition.²³⁴ Notwithstanding these limitations, however, New York’s adaptation scheme nevertheless provides a useful case study for examining how state law can support local governments in overcoming the super wicked impediments to implementing adaptation strategies applicable to a variety of climate-related risks.²³⁵

A. *The Adaptation Scheme Under the CRRA*

New York Governor Andrew Cuomo signed the CRRA into law on September 22, 2014.²³⁶ The CRRA amended three state statutes to require state agencies to consider “future physical climate risks due to sea level rise, and/or storm surges and/or flooding”²³⁷ in numerous permitting, funding, and regulatory decisions.²³⁸ Upon enacting the CRRA, New York became one of only a few states that require the compilation and analysis of state-specific climate projections.²³⁹ Specifically,

231. See, e.g., *infra* Part II.B.1.a (discussing the CRRA’s provision of scientifically rigorous flood data and inadequacy of X-zones as proxy for area of future flood risk).

232. N.Y. STATE BAR ASS’N, COMM. ON THE N.Y. STATE CONSTITUTION, REPORT AND RECOMMENDATIONS CONCERNING CONSTITUTIONAL HOME RULE 1-4 (2016) (describing New York’s home rule tradition); *but see* Baker & Rodriguez, *supra* note 49, at 1339–42 (identifying forty-six states with home rule).

233. See, e.g., 2014 N.Y. Laws 1118 (requiring state to prepare model local laws).

234. See *infra* Part II.B.1.b (discussing inappropriateness of wholesale adoption of models or of “plug and play” models).

235. See, e.g., *infra* Part II.B.1.a (discussing how state risk mapping can support difficult socio-political decisions to limit development in flood-prone areas and parts of the WUI).

236. Community Risk and Resiliency Act, 2014 N.Y. Laws 1115-18. The text of the bill (Assembly Bill 06558/Senate Bill 06617-B) is available at http://assembly.state.ny.us/leg/?default_fld=&bn=A06558&term=2013&Summary=Y. The CRRA was approved in both houses by wide margins, and had support from a diverse group of stakeholders, including The Nature Conservancy in New York, The New York League of Conservation Voters, The Business Council of New York State, the General Contractors Association, The Reinsurance Association of America, The American Institute of Architects New York State, The Municipal Arts Society of New York, Audubon New York, Natural Resources Defense Council, Environmental Advocates of New York, and The Adirondack Council. See *Votes: NY S6617/2013-2014/NY General Assembly*, LEGISCAN, <http://legiscan.com/NY/votes/S06617/2013> (last visited Oct. 25, 2014); *Bill Sponsors: NY S6617/2013-2014/NY General Assembly*, LEGISCAN, <http://legiscan.com/NY/sponsors/S06617/2013> (last visited Oct. 25, 2014).

237. 2014 N.Y. Laws 1116.

238. See *infra* notes 245–49 and accompanying text.

239. See *infra* Part II.B.1.a; see, e.g., ALASKA DEP’T OF ENVTL. CONSERVATION, ALASKA’S CLIMATE CHANGE STRATEGY: ADDRESSING IMPACTS IN ALASKA EXECUTIVE SUMMARY, at vi-vii

the CRRA mandated that by January 1, 2016, the New York State Department of Environmental Conservation (DEC) “adopt regulations establishing science-based state sea level rise projections” and “update such regulations no less than every five years.”²⁴⁰

The CRRA also made New York the first state in the nation to require state agencies to collaborate on the development of model local laws that increase climate resilience.²⁴¹ The CRRA requires DEC and the New York Department of State (DOS) to work together to prepare model local laws;²⁴² guidance on how to integrate the consideration of sea-level rise, enhanced storm surge, and future inland flooding risk into the agency review procedures and application requirements for programs specified in the Act;²⁴³ and guidance on “the use of resiliency measures that utilize natural resources and natural processes to reduce risk.”²⁴⁴

With respect to state permitting decisions, the CRRA amended New York’s Environmental Conservation Law to require DEC to consider climate risk when promulgating petroleum storage regulations,²⁴⁵ siting and designing hazardous waste facilities,²⁴⁶ approving oil and natural gas well permits,²⁴⁷ and considering applications for major projects in seven of its regulatory programs.²⁴⁸ Additionally, by adding consideration of climate-related risks to the criteria state infrastructure agencies must consider in approving or funding public infrastructure projects, the CRRA inserted climate risk analysis into the decision-making of a dozen New York State agencies.²⁴⁹

(rev. Jan. 2010) (referencing various projections made by the Alaska Climate Research Center); *id.* at vii-xii, (recommending creation of coordinated, accessible statewide system for key data collection, analysis, and monitoring); BILL RITTER, JR., COLORADO CLIMATE ACTION PLAN 27 (2007).

240. 2014 N.Y. Laws 1118-19, codified at N.Y. ENVTL. CONSERV. LAW § 3-0319 (McKinney 2014).

241. 2014 N.Y. Laws 1118; Sarah J. Adams-Schoen, *Land Use Law Update: New York’s New Climate Change Resiliency Law*, 28 MUN. LAW. 4, 5 (2014).

242. 2014 N.Y. Laws 1118.

243. *Id.*

244. *Id.*

245. 2014 N.Y. Laws 1117, (amending N.Y. ENVTL. CONSERV. LAW § 17-1015(1) (McKinney 2014)).

246. 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 27-1103(2)(g), (h) & (i) (McKinney 2014)); 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 40-0113(1)(b) (McKinney 2014)).

247. 2014 N.Y. Laws 1118 (amending N.Y. ENVTL. CONSERV. LAW § 23-0305(8-a) (McKinney 2014)).

248. 2014 N.Y. Laws 1118 (amending N.Y. ENVTL. CONSERV. LAW § 70-0117(9) (McKinney 2014)).

249. *See* 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 6-0107(2) (McKinney 2014)) (state smart growth public infrastructure criteria); *see also* N.Y. ENVTL. CONSERV. LAW § 6-0107(1) (McKinney 2018) (requiring consideration of state smart growth public infrastructure criteria by state infrastructure agencies prior to approval, undertaking, supporting or financing a public infra-

But, the CRRA is far from comprehensive in terms of the state regulatory programs affected by the law. The CRRA does not impose any requirements on applications for major projects in some DEC's largest programs.²⁵⁰ For example, the CRRA does not require consideration of climate risks in the following programs: water supply and transport;²⁵¹ wild, scenic and recreational rivers;²⁵² water quality certifications under the federal Water Pollution Control Act Amendments of 1972;²⁵³ State Pollution Discharge Elimination System;²⁵⁴ air pollution control; or collection, treatment and disposal of solid and hazardous waste.²⁵⁵

With respect to state funding decisions, as noted above, the CRRA added consideration of climate-related risks to the criteria state infrastructure agencies must consider in funding public infrastructure projects.²⁵⁶ The CRRA also amended the state's Environmental Conservation Law, Agriculture and Markets Law, and Public Health Law to require consideration of climate change risks in following six state funding determinations: (1) funding determinations under the state's Water Pollution Control Revolving Fund,²⁵⁷ (2) funding determinations under the state's Drinking Water Revolving Fund,²⁵⁸ (3) state assistance payments for municipal landfill closures,²⁵⁹ (4) state assistance payments and technical assistance for projects undertaken pursuant to (or in development of) a Local Waterfront Revitalization Program (LWRP),²⁶⁰ (5) state assistance payments for coastal rehabilita-

structure project); N.Y. ENVTL. CONSERV. LAW § 6-0103 (McKinney 2018) (defining state infrastructure agency).

250. Michael B. Gerrard, *New Statute Requires State Agencies to Consider Climate Risks*, N.Y.L.J., Nov. 13, 2014, at 2.

251. See N.Y. ENVTL. CONSERV. LAW §§ 15-1501 to 15-1529 (McKinney 2018).

252. See N.Y. ENVTL. CONSERV. LAW §§ 15-2701 to 15-2723 (McKinney 2018).

253. See 33 U.S.C. § 1341 (2017).

254. See N.Y. ENVTL. CONSERV. LAW §§ 19-0101 to 19-1105 (McKinney 2018); N.Y. ENVTL. CONSERV. LAW §§ 17-0801 to 17-0831 (McKinney 2018).

255. See N.Y. ENVTL. CONSERV. LAW §§ 27-0101 to 27-2909 (McKinney 2018).

256. See 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 6-0107(2) (McKinney 2017)) (state smart growth public infrastructure criteria); see also N.Y. ENVTL. CONSERV. LAW § 6-0107(1) (McKinney 2017) (requiring consideration of state smart growth public infrastructure criteria by state infrastructure agencies prior to approval, undertaking, supporting or financing a public infrastructure project); N.Y. ENVTL. CONSERV. LAW § 6-0103 (defining state infrastructure agency).

257. 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 17-1909(1)(d)(ii)(e) (McKinney 2007)).

258. 2014 N.Y. Laws 1118 (amending N.Y. PUB. HEALTH LAW § 1161 (McKinney 2012)).

259. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW § 54-0503 (McKinney 2008)).

260. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW § 54-1101(1) (McKinney 2008)).

tion projects,²⁶¹ and (6) state assistance payments for locally-led agricultural and farmland protection activities.²⁶²

The CRRA also inserted climate-related risk analysis into open space land acquisition and maintenance decisions. Section 6 amended the state land acquisition policy to require DEC and the New York State Office of Parks, Recreation and Historic Preservation (OPRHP) to consider “future physical climate risk due to sea level rise, and/or storm surge and/or flooding.”²⁶³ Section 7 amended the considerations required for the Commissioner of OPRHP to enter into an agreement with a municipality for the maintenance and operation of open space land conservation projects in urban areas or metropolitan park projects.²⁶⁴ Prior to the amendment, the Commission’s authorization to enter such an agreement was premised on demonstration that the municipality was capable of operating and maintaining the project for the benefit of the public and maximizing public access to the project.²⁶⁵ As amended, the Commissioner’s authorization also requires the municipality consider “future physical climate risk due to sea level rise, and/or storm surges and/or flooding.”²⁶⁶

The CRRA does not mandate any specific mitigation or other action in response to the required climate risk considerations,²⁶⁷ making the New York scheme similar in this respect to the National Environmental Policy Act.²⁶⁸ With respect to environmental reviews, the CRRA also did not amend the State Environmental Quality Review Act (SEQRA),²⁶⁹ but the DEC has since promulgated new rules clarifying that SEQRA does require consideration of climate resilience aspects of state projects.²⁷⁰ The CRRA also does not require designation of areas at significant risk of flooding or impose mandatory implementation of risk-reduction measures in such areas,²⁷¹ or require any other municipal action.²⁷² It also does not

261. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW §§ 54-1105(1) & (5) (McKinney 2008)).

262. 2014 N.Y. Laws 1117-18 (amending N.Y. AGRIC. & MKTS. LAW § 325(2)(f) (McKinney 2004)).

263. 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 49-0203 (McKinney 2008)).

264. 2014 N.Y. Laws 1116 (amending N.Y. ENVTL. CONSERV. LAW § 54-0303(2)(a) (McKinney 2008)). Section 54-0303 also governs open space maintenance and operation agreements with not-for-profit corporations and unincorporated associations. *Id.*

265. N.Y. ENVTL. CONSERV. LAW § 54-0303 (2)(a) (McKinney 2008).

266. 2014 N.Y. Laws 1116.

267. Michael B. Gerrard, *New Statute Requires State Agencies to Consider Climate Risks*, N.Y.L.J., Nov. 13, 2014, at 3.

268. *See* 42 U.S.C. § 4321 (2006).

269. Gerrard, *supra* note 267, at 8.

270. *See infra* Part III.B.2.

271. Gerrard, *supra* note 267, at 3; *but see* N.Y. STATE SEA LEVEL RISE TASK FORCE, REPORT TO THE LEGISLATURE 8 (2010) http://www.dec.ny.gov/docs/administration_pdf/slrffinalrep.pdf (recommending inclusion of these features).

provide any new sources of funding, does not directly amend the state building code, and does not establish permit issuance or design standards.²⁷³

B. Lessons Learned from the CRRA: Moving Beyond a Local Power/Local Powerless Dichotomy to Facilitate Local Lawmaking Through State-Local Partnership

This section examines how these features of the CRRA, and New York's adaptation scheme as a whole, work together to address—or fail to address—super wicked features of the climate resilience problem. For adaptation lawmaking strategies to be effective, they must overcome the super wicked attributes that make the climate resilience problem “highly resistant to resolution,”²⁷⁴ which means they must use “techniques that are consistent with, rather than ignore, the key features of this class of problems.”²⁷⁵ A key feature of this super wicked problem is an institutional conundrum whereby the entity with the greatest potential to solve the problem currently lacks the capacity to do so such that efforts to respond to the problem tend to exacerbate it rather than resolve it.²⁷⁶

With respect to this institutional conundrum, effective solutions must both recognize the essential role of local governments²⁷⁷ and help local governments increase adaptive capacity by providing critical technical resources,²⁷⁸ restructuring governance institutions for regulating and planning resilient land uses,²⁷⁹ and expanding socio-political will.²⁸⁰ To expand socio-political will, local governments must overcome temporal free-riding, which is another super wicked feature of the climate resilience problem.²⁸¹

272. N.Y. DEP'T OF ENVTL. CONSERVATION, OFFICE OF CLIMATE CHANGE, COMMUNITY RISK AND RESILIENCY ACT: MAINSTREAMING CONSIDERATION OF CLIMATE CHANGE 30 (July 2018) https://www.dec.ny.gov/docs/administration_pdf/sfrmgmtg.pdf (PowerPoint presentation from July 2018 public information and comment meetings).

273. *Id.*

274. AUSTL. PUB. SERV. COMM'N, TACKLING WICKED PROBLEMS: A PUBLIC POLICY PERSPECTIVE, at iii (2007), <http://www.enablingchange.com.au/wickedproblems.pdf>.

275. Levin et al., *supra* note 151, at 129.

276. *See* INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: MITIGATION OF CLIMATE CHANGE § 12.6.1 (2014) (discussing the “urban institutional climate conundrum,” characterized by cities with the greatest potential to reduce greenhouse gas emissions lacking the institutional capacity to do so); INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION AND VULNERABILITY § 8.4.3.4 (2014) (observing a similar problem with respect to urban adaptation).

277. *See supra* Part II.A.

278. *See infra* Part II.B.1.b.

279. *See infra* Part II.B.2.

280. *See infra* Part II.B.2.b.; *supra* notes 135–144 and accompanying text.

281. *See* Lazarus, *supra* note 152, at 1183 (“[T]he tremendous spatial and temporal dimensions associated with ecological injury create tremendous impediments to effective political organization in

1. Expanding Local Adaptive Capacity by Responding to Critical Resource Gaps

The CRRA recognizes the essential role of local governments in increasing community resilience, and those governments' need for state support in responding to climate-related risks. The CRRA does this by requiring the state to promulgate downscaled flood risk projections,²⁸² model local laws,²⁸³ and implementation guidance.²⁸⁴ These requirements expand local government adaptive capacity by responding to critical resource gaps faced by local governments—namely, the need for locally-relevant, scientifically-rigorous data,²⁸⁵ and technical and legal support.²⁸⁶

a. Locally Relevant, Scientifically Rigorous Risk Projections

As a practical matter, local government capacity to create resilient communities is hamstrung by the need for downscaled climate data to support effective adaptation lawmaking. In 2010, the legislatively created New York Sea Level Rise Task Force, which proposed a number of strategies later codified in the CRRA,²⁸⁷ found that “[e]xisting maps of New York State’s coast that identify communities, habitats and infrastructure at greatest risk of flooding and erosion are inaccurate, out of date, not detailed enough for planning and regulatory purposes and fail to incorporate historic and projected sea level rise.”²⁸⁸ In November 2014, the President’s State, Local, and Tribal Leaders Task Force concluded that:

Insufficient or inaccurate data stymie hazard evaluation and sound mitigation plan development. In particular, out-of-date or inaccurate flood hazard maps impede the efforts of communities to understand and assess vulnerability to sea level rise, coastal storm surge, and riverine flooding and to develop policies and projects to reduce risk. Erosion hazards, which are likely to worsen in many parts of the country due to predicted increases in extreme precipitation events, remain largely unmapped.

favor of environmental protection. The pool of those adversely affected is simply too spread out over space and time to effectively organize for collective action.”).

282. 2014 N.Y. Laws 1118-19 (codified at N.Y. ENVTL. CONSERV. LAW § 3-0319 (McKinney 2015)).

283. 2014 N.Y. Laws 1118.

284. 2014 N.Y. Laws 1118.

285. See *infra* Part II.B.1.a.

286. See *infra* Part II.B.1.c.

287. See N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 8.

288. *Id.* at 7.

Communities also lack information about changing wildfire risk, drought and other climate-influenced hazards.²⁸⁹

Similarly, in an article examining three states' legal strategies for supporting local regulation of flood risks, Jessica Grannis identified as a hurdle a lack of risk maps scientifically rigorous enough to be used for regulatory purposes.²⁹⁰ Specifically, Grannis assessed whether Connecticut communities could benefit from adopting a model zoning ordinance that the Georgetown Climate Center had developed for Maryland.²⁹¹ The Maryland model attempts to do two things: (1) "extend[] the boundaries of the areas subject to floodplain regulations to protect development that will become increasingly vulnerable to impacts as [sea level rise] drives flooding inland,"²⁹² and (2) divide the floodplain into two zones, an accommodation zone and a retreat zone.²⁹³ In evaluating whether Connecticut communities could adopt the model, Grannis concluded that local governments would face difficulty determining where to draw the boundaries for the accommodation and retreat zones because Connecticut communities did not have access to scientifically rigorous flood-risk maps.²⁹⁴

As an alternative, Grannis proposed that communities use existing floodplain boundaries developed by FEMA.²⁹⁵ Under the NFIP, FEMA has developed Flood Insurance Rate Maps (FIRMs) that divide the coastal and inland floodplain into different zones, including: A-zones, which include inland areas of the 100-year floodplain; V-zones, which include areas of the 100-year floodplain that are subject to wave action; and X-zones, which include the 500-year floodplain.²⁹⁶ FEMA requires regulation of A- and V-zones in order for a community to be eligible to par-

289. THE WHITE HOUSE, PRESIDENT'S STATE, LOCAL, AND TRIBAL LEADERS TASK FORCE ON CLIMATE PREPAREDNESS AND RESILIENCE: RECOMMENDATIONS TO THE PRESIDENT 35 (2014).

290. Grannis et al., *supra* note 102, at 72–73.

291. *Id.* at 68.

292. JESSICA GRANNIS, ZONING FOR SEA-LEVEL RISE: A MODEL SEA-LEVEL RISE ORDINANCE AND CASE STUDY OF IMPLEMENTATION BARRIERS IN MARYLAND 2 (unpublished draft, 2012); *see also* JESSICA GRANNIS ET AL., A MODEL SEA LEVEL RISE OVERLAY ZONE FOR MARYLAND LOCAL GOVERNMENTS: EXPERT REVIEW REPORT 1 (2011) [hereinafter GRANNIS ET AL., MODEL SEA LEVEL RISE OVERLAY ZONE].

293. GRANNIS ET AL., MODEL SEA LEVEL RISE OVERLAY ZONE, *supra* note 292, at 8. Note that the model calls these zones the Floodplain Accommodation District and Floodplain Conservation District. *Id.*

294. Grannis et al., *supra* note 102, at 72–73.

295. *Id.* at 73.

296. *Flood Zones*, FED. EMERGENCY MGMT. AGENCY, <https://www.fema.gov/flood-zones> (last updated Sept. 14, 2018); *see also* Biggert-Waters Flood Insurance Reform Act of 2012, 42 U.S.C. § 4004(a)(1)–(2) (2012) (defining 100-year and 500-year floodplains); 44 C.F.R. § 59.1 (2006) (defining high hazard areas and special flood hazard areas).

participate in the NFIP;²⁹⁷ FEMA does not require regulation of X-zones.²⁹⁸ These FEMA zones, however, are based on historic flood data, and do not reflect future flood risk from sea level rise or increased precipitation.²⁹⁹ As a result, the FEMA flood zones significantly underestimate the likelihood of flooding in many areas and fail to designate many areas as at risk when in fact they are.³⁰⁰ Recent catastrophic flooding in Houston illustrates the inadequacy of the current FEMA boundaries.³⁰¹

To overcome this limitation, Grannis proposes that communities that lack access to more scientifically rigorous risk mapping use X-zones to implement the model ordinance.³⁰² However, this alternative has the potential to leave communities unprepared, as Grannis acknowledges.³⁰³ First, because the NFIP only considers historic risk factors,³⁰⁴ the FEMA boundaries do not account for projected increases in risk from rapid rain accumulation, how buildings are constructed, where buildings and infrastructure are sited, climate change, or expected population growth, among other relevant factors.³⁰⁵ Second, although FEMA has produced risk maps for nearly all coastal flood hazard areas, FEMA has only partially mapped fluvial (riverine) and pluvial (rainfall-driven) flood hazard areas.³⁰⁶ These

297. See generally 44 C.F.R. § 60.3 (2011); see also 42 U.S.C. § 4012a(a) (2012) (prohibiting federal officers and agencies from approving financial assistance for acquisition or construction in special flood hazards in which the sale of flood insurance has been made available under the NFIP); *id.* § 4022(a)(1) (making NFIP flood insurance contingent on state or local adoption of land use and flood control measures).

298. See *Flood Maps and Zones Explained*, FED. EMERGENCY MGMT. AGENCY, (Apr. 4, 2018, 2:54 PM), <https://www.fema.gov/disaster/updates/fema-flood-maps-and-zones-explained>.

299. Sarah Pralle, *Drawing Lines: FEMA and the Politics of Mapping Flood Zones*, CLIMATE CHANGE, Sept. 2018, at 5, https://www.maxwell.syr.edu/uploadedFiles/faculty/psc/Pralle_Drawing%20Lines_APSA2017.pdf (paper prepared for presentation at the American Political Science Association's Annual Conference in San Francisco, California, 2017).

300. See *supra* notes 135–37 and accompanying text.

301. See, e.g., Nicholas Pinter et al., UC Davis Ctr. for Watershed Scis., *Preliminary Analysis of Hurricane Harvey Flooding in Harris County, Texas*, CAL. WATERBLOG (Sept. 1, 2017), <https://californiawaterblog.com/2017/09/01/preliminary-analysis-of-hurricane-harvey-flooding-in-harris-county-texas/> (reporting on University of California study that concluded that, “[b]y some calculations, the current flooding represents the third ‘500-year’ flood in the Houston area in the past three years”); see also *infra* notes 135–37 and accompanying text.

302. Grannis et al., *supra* note 102, at 73.

303. Grannis et al., *supra* note 102, at 73–74.

304. Michael Keller et al., *Outdated and Unreliable: FEMA's Faulty Flood Maps Put Homeowners at Risk*, BLOOMBERG (Oct. 6, 2017), <https://www.bloomberg.com/graphics/2017-fema-faulty-flood-maps/>.

305. *Id.*

306. Oliver E. J. Wing et al., *Estimates of Present and Future Flood Risk in the Conterminous United States*, ENVTL. RES. LETTERS 13, Feb. 28, 2018, at 1, 3, <http://iopscience.iop.org/article/10.1088/1748-9326/aaac65/pdf> (study finding almost 41 million people in the United States live within the 100-year floodplain (also known as the 1% annual exceedance probability floodplain), compared to only 13 million when calculated using FEMA flood maps).

deficiencies affect all zones in the FIRMs, not just the A- and V-zones.³⁰⁷ Illustrative of these deficiencies, the City of Houston reported that 33% of homes in the X-zone flooded during Harvey,³⁰⁸ and researchers at the University of California-Davis Natural Hazards Research and Mitigation Group reported that approximately 40 percent of the buildings estimated by FEMA to have been flooded in Harris County, Texas, were in areas “of minimal flood hazard”—i.e., outside A-, V- or X-zones.³⁰⁹ Similarly, a Department of Homeland Security study also found that only 42% of FEMA FIRMs “adequately identified the level of flood risk,” according to fiscal year 2017 data.³¹⁰

Third—even if X-zones reflect future flood risk in some communities sufficient to guide adaptation policymaking³¹¹—a lack of mapping that explicitly considers future climate risks will likely be an impediment to local governments making the difficult decisions adaptation requires. Communities may be unwilling to adopt retreat (or even accommodation) strategies based on data that purports to map 500-year floods, especially given the economic and social costs associated with retreat (and accommodation), and persistent resistance to such strategies.³¹² Although the X-zone covers a larger area than the A- or V-zones and may therefore in some cases more accurately designate the areas in a community at significant risk of flooding,³¹³ FEMA defines the X-zone as having only a 0.2% to 1% chance of

307. See Pinter et al., *supra* note 301 (reporting on failure to classify flood risk areas in any zone); DEP’T OF HOMELAND SEC., INSPECTOR GEN.’S OFFICE, OIG-17-110, FEMA NEEDS TO IMPROVE MANAGEMENT OF ITS FLOOD MAPPING PROGRAMS 2–3 (2017), <https://www.documentcloud.org/documents/4066233-OIG-17-110-Sep17.html>.

308. CITY OF HOUS., FLOODPLAIN MANAGEMENT DATA ANALYSIS CH. 19, at 3 (2018), <http://www.houstontx.gov/council/g/chapter19/Floodplain-Mgmt-Data-Analysis.pdf> (finding that 84 percent of the homes flooded during Hurricane Harvey would not have flooded if all new structures in the 500-year floodplain were elevated 2 feet above the 500-year flood elevation).

309. Pinter et al., *supra* note 301.

310. DEP’T OF HOMELAND SEC., *supra* note 307, at 4; see also Wing et al., *supra* note 306, at 1, 3 (study finding almost 41 million people in the United States live within the 100-year floodplain (also known as the 1% annual exceedance probability floodplain), compared to only 13 million when calculated using FEMA flood maps).

311. Grannis et al. report that “[a]lthough the X-zone is not a perfect proxy for how SLR may impact a community, these are areas that FEMA’s Flood Insurance Studies demonstrate are at risk from a statistical suite of storms that are characteristic for Connecticut.” Grannis et al., *supra* note 102, at 73 n.74. Illustrating how a community can use the X-zone as a proxy for future flood risk, Grannis et al. report that Cedar Falls, Iowa recently extended its floodplain regulations to its 500-year floodplain. *Id.* at n.74; see also CEDAR FALLS ZONING ORD. § 29-156, https://library.municode.com/ia/cedar_falls/codes/code_of_ordinances?nodeId=COOR_CH29ZO_ARTIINDIDIRE_DIV2SPDI_S29-156 FLFROVDI.

312. GRANNIS ET AL., A MODEL SEA-LEVEL RISE OVERLAY *supra* note 292, at 32 (finding that “[d]ownzoning may limit the economic development value of coastal lands and can reduce the government tax base as nonconforming uses are phased out over time” and “[d]ownzonings often face intense political opposition from affected property owners”).

313. See CITY OF HOUS., *supra* note 308, at 3 (finding that 84 percent of the homes flooded during Hurricane Harvey would not have flooded if all new structures in the 500-year floodplain were ele-

flooding in any given year.³¹⁴ This simply does not sound like a sufficient risk to warrant the significant lost opportunities and direct and indirect costs associated with costly retreat or accommodation strategies.

Fourth, given that adaptation initiatives can significantly decrease property owners' returns on investment,³¹⁵ basing such policies on X-zone designations may also subject the regulatory entity to increased litigation risk. For example, use of X-zone or other proxy designations in lieu of scientifically rigorous projections may subject local governments to challenges based on substantive due process³¹⁶ or regulatory takings claims. Where a regulation diminishes, but does not completely eliminate, development value, a takings claim is decided using the multifactor test from *Penn. Central Transportation Co. v. City of New York*.³¹⁷ One of the *Penn. Central* factors includes "the extent to which the regulation has interfered with distinct investment backed expectations."³¹⁸ Developers facing costly retreat or accommodation regulations may argue that a property's location in an X-zone lulled him or her into believing the property's income generating potential would not be significantly limited by flood risk or related regulations.³¹⁹

However, the regulator has a good argument that a developer's expectation that he or she will earn a significant return on a property that is located in a vulnerable area is not reasonable, and the *Penn. Central* test looks at reasonable investment backed expectations.³²⁰ Even for properties in an X-zone, the developer's

vated 2 feet above the 500-year flood elevation). Note that this finding is based on an expansion of the regulated floodplain from the 100-year to the 500-year flood zones, and an increase in the structure elevation requirement from one foot to two feet. *Id.*

314. *Flood Zones*, FED. EMERGENCY MGMT. AGENCY, <https://www.fema.gov/flood-zones> (last updated Dec. 13, 2017); 42 U.S.C. § 4004(a)(2) (2012).

315. See Rumore, *supra* note 140.

316. See generally *Vill. of Euclid v. Ambler Realty, Co.*, 272 U.S. 395 (1926); see, e.g., *Nicholas v. Zoning Comm'n of Town of Ledyard*, No. 522997, 1995 WL 27500, at *4 (Conn. Super. Ct. Jan. 18, 1995) (requiring local government to provide sufficient evidence documenting probability of threat when imposing new regulations to address future conditions); *Toll Bros., Inc. v. Bethel Planning & Zoning Comm'n*, No. HHBCV030523881S, 2006 WL 3114387, at *3 (Conn. Super. Ct. Oct. 19, 2006) (finding zoning commission had insufficient evidence that future traffic would cause threat to public health).

317. 438 U.S. §§ 104, 124 (1978).

318. *Id.*

319. See *infra* notes 321–22.

320. See *Palazzolo v. Rhode Island*, 533 U.S. 606, 617 (2001) (explaining the holding of *Penn Central*):

Where a regulation places limitations on land that fall short of eliminating all economically beneficial use, a taking nonetheless may have occurred, depending on a complex of factors including the regulation's economic effect on the landowner, the extent to which the regulation interferes with *reasonable* investment-backed expectations, and the character of the government action.

Id. (emphasis added).

expected return on investment should factor in the dozens of publicly-available reports that find FEMA's FIRMs significantly underestimate flood risk.³²¹ That said, given the shortcomings of the FEMA zones, reliance on them as a basis for regulations that will significantly limit development or increase development costs could increase litigation risk for local governments and, as a result, pose an obstacle to local resilience lawmaking.³²²

The New York law overcomes these deficiencies by mandating that DEC prepare scientifically rigorous risk projections and update those projections every five years.³²³ In so doing, the CRRA requires that DEC "consider information including, but not limited to, reports of the Intergovernmental Panel on Climate Change, the National Oceanic Atmospheric Administration Climate Assessment, the Sea Level Rise Task Force report . . . , projections prepared by the New York City Panel on Climate Change and any other relevant regional, state and local reports."³²⁴ DEC finalized regulations in early 2017 that establish the statewide sea-level rise projections.³²⁵ DEC in partnership with other state agencies, academic institutions, and non-profits developed the projections in these regulations using data from "ClimAID model outputs," which the regulations define as "global climate models, downscaled to New York, and additional information, including information to account for anticipated changes in the rates of ice melt that cannot yet be more rigorously included in quantitative models."³²⁶

In implementing this provision of the CRRA, DEC adopted regulations that provide even more granular data than required by the law. The regulations include five projections ranging from "low" to "high" levels of sea-level rise for three regions: Mid-Hudson, New York City/Lower Hudson, and Long Island.³²⁷ The projections include four timescales: 2020s, 2050s, 2080s, and 2100.³²⁸ The high-level projections show sea level in the New York City area rising by 75 inches (6.2 feet) by the year 2100.³²⁹

321. See, e.g., Pinter et al., *supra* note 301; DEP'T OF HOMELAND SEC., *supra* note 307; Wing et al., *supra* note 306, at 1-2; CITY OF HOUS., *supra* note 308, at 8; see also Nolon, *supra* note 28, at 557 (asking, "If it is now known that sea-level rise endangers development, does a landowner have legitimate expectations to fully develop the parcel?").

322. In my experience working with local governments on climate resilience planning and lawmaking, the specter of increased litigation risk, whether plaintiffs would ultimately succeed or not, has a chilling effect.

323. 2014 N.Y. Laws 1118, codified at N.Y. ENVTL. CONSERV. LAW § 3-0319 (McKinney 2015).

324. *Id.*

325. N.Y. COMP. CODES R. & REGS. tit. 6, § 490 (2017).

326. *Id.* § 490.3(e).

327. *Id.* § 490.4.

328. *Id.*; see also N.Y. ENVTL. CONSERV. LAW § 3-0319, practice commentaries by Kevin Anthony Reilly (McKinney 2017).

329. N.Y. COMP. CODES R. & REGS. tit. 6, § 490.4. (2017).

The result of this feature of the state adaptation scheme and the regulations implementing it is that local governments now have locally relevant risk projections rigorous enough to be used for regulatory purposes. Additionally, by codifying a high-level projection that presents the possibility of widespread, disastrous flooding,³³⁰ the state has shifted the socio-political landscape by putting landowners, tenants, developers, insurers, local governments, and other regulated persons and stakeholders on notice of the vulnerability of large swaths of the state.³³¹

b. Technical and Legal Support for Resource-Constrained Local Governments

In addition to needing locally relevant, scientifically rigorous risk mapping, local governments need technical and legal support to help them navigate technical and legal issues related to adaptation. Local planning and lawmaking for climate resilience is a complex, time-consuming, and resource-intensive task.³³² Among other things, local governments must identify existing vulnerable development, critical facilities, infrastructure, and natural resource assets;³³³ identify and map risk areas;³³⁴ engage the public and other stakeholders in these processes;³³⁵ and navigate relevant local, county, state, and federal laws, some of which may be conflicting.³³⁶

Thus, many sources have concluded that local government adaptive capacity is constrained by an unmet need for technical and legal support.³³⁷ Recognizing this

330. See *id.*; see also BEN STRAUSS ET AL., *NEW YORK AND THE SURGING SEA: A VULNERABILITY ASSESSMENT WITH PROJECTIONS FOR SEA LEVEL RISE AND COASTAL FLOOD RISK*, CLIMATE CENTRAL RESEARCH REPORT 11 (2014) (computing “a 3-in-4 chance of historically unprecedented coastal flooding in New York City by 2100” under a scenario similar to the CRRA’s high level scenario).

331. Michael B. Gerrard & Edward McTiernan, *New York’s New Sea Level Rise Projections Will Affect Land Use, Infrastructure*, N.Y.L.J., Mar. 9, 2017, at 1 (“Now that they are embodied in a formal regulation, these projections may begin to affect a broad range of decisions in building and infrastructure siting, design, construction and materials; insurance and financing; securities disclosure; and estate planning.” (citation omitted)); *id.* at 3 (“more difficult issues of risk management and fiduciary responsibility face those with longer-term interests (and their counsel),” including providers of long-lived infrastructure like airports and power-plants, tenants contemplating long-term leases, trustees of estates holding real property intended to benefit future generations, local planning and zoning officials, and architects, engineers and other design professionals).

332. See GRANNIS, *supra* note 114, at 6–7.

333. See *id.* at 14.

334. See *id.* at 7.

335. See *supra* notes 75–79 and accompanying text.

336. See GRANNIS, *supra* note 114, at 8; see also *supra* Part I.B.3 (discussing and citing fragmented, diffuse and conflicting laws governing the WUI and flood hazard areas).

337. See, e.g., GOV’T ACCOUNTABILITY OFFICE, GAO REPORT: FUTURE FEDERAL ADAPTATION EFFORTS COULD BETTER SUPPORT LOCAL INFRASTRUCTURE DECISION MAKERS 80 (2013) (finding local decision makers do not have easy access to information needed to facilitate in-

barrier to effective local resilience planning and lawmaking, the New York Sea-Level Rise Task Force recommended that the state provide, among other things, “guidance, risk maps, other tools and technical assistance to empower local decision makers to analyze their communities’ circumstances through vulnerability assessments that will lead them to develop appropriate strategies for reducing vulnerability.”³³⁸ The Task Force recommended that these tools include “a database of feasible adaptation responses for communities . . . that allows each community to compare alternate strategies for achieving mutual, desired goals and to select the strategy most appropriate for its own situation.”³³⁹

The CRRA responded to this barrier to local climate resilience governance by mandating that the state issue model local laws;³⁴⁰ guidance on how to integrate the consideration of sea-level rise, enhanced storm surge, and future inland flood risk into agency review procedures and application requirements for programs specified in the Act;³⁴¹ and guidance on “the use of resiliency measures that utilize natural resources and natural processes to reduce risk.”³⁴² With respect to the model local laws, the CRRA requires DEC and DOS to work together to prepare the model local laws.³⁴³ As for the content of these model local laws, the CRRA requires only that the model laws “include consideration of future physical climate risk due to sea level rise, and/or storm surges and/or flooding, based on available data predicting the likelihood of future extreme weather events including hazard risk analysis.”³⁴⁴ With respect to the implementation guidance, the CRRA provides that the guidance must include “available and relevant data sets and risk analysis tools and available data predicting the likelihood of future extreme weather events.”³⁴⁵

Although the state has not yet issued draft or final model local laws, presentations by the agencies working on this provision of the state’s adaptation scheme indicate that this tool may overcome a number of shortcomings that cause some

formed local infrastructure adaptation decisions); N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 50 (“Communities need guidance to develop and implement local regulations and zoning laws that will reduce new development in high-risk areas and manage risks to existing infrastructure, property and people.”).

338. N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 49.

339. *Id.*

340. 2014 N.Y. Laws 1118.

341. *See id.*

342. *Id.*

343. *Id.*

344. *Id.*

345. *Id.* Note that, under New York law, statutes providing that a state agency “shall” adopt regulations by a certain date are directory, not mandatory. *See* N.Y. STAT. LAW § 172 (McKinney 2018); 121-129 Broadway Realty, Inc. v. N.Y. State Div. of Human Rights, 349 N.Y.S.2d 1003, 1005 (N.Y. App. Div. 1973).

model laws to sit on a shelf collecting dust.³⁴⁶ Based on ongoing work on this tool, it appears that DOS recognizes that a single model code will not provide the most helpful resource to local governments, and instead is creating a guidance document that identifies a range of local laws that affect adaptation and provides recommendations regarding potential amendments to those laws.³⁴⁷

This is an approach that has the potential to at least partially address the need for legal expertise related to the dozens of local, county, and federal laws affecting land uses in vulnerable areas like coastal and inland floodplains.³⁴⁸ Many place-specific variables affect local adaptation planning, such that one-size-fits-all or “plug and play” model laws may not meet the needs of local governments. The DOS explains that its approach is driven in part by the variation between local governments with respect to risks, challenges, landscapes, regulatory culture, and administrative capacity.³⁴⁹ A report assessing the feasibility of Maryland local governments adopting a model zoning ordinance developed by Georgetown Climate Center, also highlighted variability as a barrier to adoption of a one-size-fits-all model:

There is no one-size-fits-all approach to adaptation because communities have widely different terrain, including different states of development, resources at risk (e.g., critical facilities, natural resources), potential for armoring, perception and sensitivities to risk, among other things. As a result, policies that may be politically untenable in one community may be well received in another.³⁵⁰

Additionally, one of the benefits of local governance is the opportunity to engage local stakeholders at the front end of the planning effort,³⁵¹ which cannot happen if the community adopts a one-size-fits-all model. In a report analyzing legal and policy barriers to a model ordinance, Grannis found that:

Provisions in floodplain and zoning ordinances are not very “plug and play.” Although many floodplain and zoning ordinances originate from common model ordinances, jurisdictions [must] transform[] the model provisions to address the particularized needs of their communities—using different definitions and applying different organizations. This makes it difficult to cut provisions from one jurisdiction’s ordinance and paste them into another jurisdiction’s code without understanding the or-

346. See N.Y. DEP’T OF ENVTL. CONSERVATION, COMMUNITY RISK AND RESILIENCY ACT: REDUCING FLOOD RISK IN NEW YORK STATE 47-50 (2017).

347. See *id.*

348. See *infra* Part II.B.3 (discussing and citing laws governing the WUI and flood hazard areas).

349. N.Y. DEP’T OF ENVTL. CONSERVATION, *supra* note 346, at 48.

350. GRANNIS ET AL., MODEL SEA LEVEL RISE OVERLAY ZONE, *supra* note 292, at 5.

351. See *supra* notes 75–85 and accompanying text.

ganic whole of how the provision functions in the originating ordinance.³⁵²

Responding to wide variation at the local level and the need for local engagement at the front end of the local lawmaking process, it appears the model laws DOS and DEC are preparing will contain a menu of potential local laws and recommendations regarding potential amendments to those laws, which local communities can consult as they engage in local planning, assessment, and lawmaking. The state model laws will include provisions related to “basic” land use law (including zoning and subdivision regulations)³⁵³ and resilience-related provisions in local laws governing wetland and watercourse protection,³⁵⁴ management of floodplain development,³⁵⁵ coastal shoreline protection,³⁵⁶ and stormwater control measures.³⁵⁷ The “basic” tools will include provisions regarding home elevations and variances,³⁵⁸ visual mitigation for elevated structures,³⁵⁹ non-conversion agreements for space under elevated structures,³⁶⁰ phased reconstruction moratoria,³⁶¹ and various accommodation provisions related to subdivision regulations.³⁶² By cataloging the range of local laws that affect adaptation and providing recommendations regarding potential amendments to those laws, the New York approach provides for place-specific decision-making, local stakeholder engagement, and recognizes that the complex web of resilience-related laws differ from one local jurisdiction to another.

Additionally, early information about the model laws suggests that the state will provide legal language and assessment tools that will assist local governments in adopting not only accommodation strategies,³⁶³ but also retreat strategies.³⁶⁴ For example, some of the amendments to subdivision regulations DOS is considering including in the model include prohibitions on new subdivision lots in flood prone areas, minimum lot sizes sufficient to accommodate retreat, and deductions of land unsuitable for development (or that provides important natural functions) from

352. GRANNIS ET AL., MODEL SEA LEVEL RISE OVERLAY ZONE, *supra* note 292, at 54.

353. See N.Y. DEP'T OF ENVTL. CONSERVATION, *supra* note 346, at 50–53.

354. *Id.* at 50, 54–57.

355. *Id.* at 50, 54–55.

356. *Id.* at 50, 56.

357. *Id.* at 50, 57.

358. *Id.* at 52.

359. *Id.*

360. *Id.*

361. *Id.* at 53.

362. *Id.* at 51.

363. See, e.g., *id.* at 52 (describing model law provisions related to accommodating development in vulnerable areas by requiring elevation of structures).

364. See, e.g., *id.* at 51, 58.

buildable land calculations.³⁶⁵ DOS is also considering including model plat disclosure provisions, which would require developers to alert potential buyers to environmental constraints and construction requirements,³⁶⁶ a feature that could facilitate market-driven retreat. Finally, DOS is considering including in the model laws guidance on non-regulatory strategies that could facilitate retreat such as property acquisition programs.³⁶⁷

The state has also begun to issue the implementation guidance required by the CRRA.³⁶⁸ In November 2017, DEC issued a guidance document titled “Tidal Wetlands Guidance Document: Living Shoreline Techniques in the Marine District of New York State,” which references the sea level rise projections.³⁶⁹ This proposed guidance emphasizes “nature-based solutions”³⁷⁰ to protect tidal wetlands, which, in turn, benefit water quality, marine food production, and wildlife habitat, and provide flood, hurricane, and storm control measures.³⁷¹

In June 2018, DEC released for public review two additional draft guidance documents:³⁷² Guidance for Smart Growth Public Infrastructure Assessment,³⁷³ and the New York State Flood Risk Management Guidance for Implementation of the Community Risk and Resiliency Act.³⁷⁴ The Guidance for Smart Growth Public Infrastructure Assessment is intended to assist state agencies in their assessment of whether applicants for public-infrastructure projects meet the CRRA’s requirements regarding mitigation of sea-level rise, storm surge, and flooding.³⁷⁵ The flood-risk management guidance is intended to assist state agencies in meeting the CRRA’s requirement that applicants demonstrate consideration of sea-level rise,

365. *Id.* at 51.

366. *Id.*

367. *Id.* at 58.

368. 2014 N.Y. Laws 1118.

369. N.Y. STATE DEPT. OF ENVTL. CONSERVATION, TIDAL WETLANDS GUIDANCE DOCUMENT: LIVING SHORELINE TECHNIQUES IN THE MARINE DISTRICT OF NEW YORK STATE 15–17, 19–21 (2017); *id.* app. C (describing the CRRA and setting forth DEC’s proposed sea-level rise projections).

370. *Id.* at 6.

371. *Id.* at 33; *see also* N.Y. ENVTL. CONSERV. LAW § 3-0319, practice commentaries by Kevin Anthony Reilly (McKinney 2015).

372. Press Release, Dep’t of Env’tl. Conservation, DEC Releases Draft Flood Risk Management Guidance Supports Governor Cuomo’s Resilient NY Initiative to Bolster Community Resiliency and Reduce Flood Risk (June 20, 2018), <https://www.dec.ny.gov/press/114000.html> [hereinafter DEC Press Release]. Public comments were due on the draft guidance by August 20, 2018. *Id.*

373. N.Y. DEP’T OF ENVTL. CONSERVATION, COMMUNITY RISK AND RESILIENCY ACT DRAFT GUIDANCE FOR SMART GROWTH PUBLIC INFRASTRUCTURE ASSESSMENT (2018), https://www.dec.ny.gov/docs/administration_pdf/nysdga.pdf [hereinafter NYS DRAFT SMART GROWTH GUIDANCE].

374. N.Y. STATE DEP’T OF ENVTL. CONSERVATION, DRAFT NEW YORK STATE FLOOD RISK MANAGEMENT GUIDANCE FOR IMPLEMENTATION OF THE COMMUNITY RISK AND RESILIENCY ACT (2018) [hereinafter NYSFRM DRAFT GUIDANCE].

375. NYS DRAFT SMART GROWTH GUIDANCE, *supra* note 373.

storm surge, and flooding.³⁷⁶ Specifically, the flood-risk management guidance is “intended primarily for consideration in determination of the suitable location for construction of a proposed structure or other regulated activity, given future physical risks, within a permit’s jurisdictional area.”³⁷⁷ DEC also intends this guidance to inform several additional guidance documents that DEC and DOS will issue as part of their implementation of the CRRRA, including Model Local Laws for Community Resiliency.³⁷⁸ The New York Department of Transportation incorporated this draft guidance into the state Bridge Manual,³⁷⁹ which governs design of bridges in the state.³⁸⁰ Governor Cuomo has directed DOS to recommend changes to the State Fire Prevention and Building Code based on these guidance documents.³⁸¹

c. Funding for Local Resilience Initiatives

Local governments consistently report that securing funding for adaptation is a challenge.³⁸² This challenge contributes to the super wicked nature of the climate resilience problem most acutely with respect to retreat. Development tends to increase the government tax base, and this is especially true of high value properties like many waterfronts³⁸³ and parts of the WUI.³⁸⁴ More holistic perspectives recognize that maladaptive development has steep costs that often outweigh benefits.³⁸⁵ These costs include the costs of losing recreational benefits, wildlife shel-

376. NYSFRM DRAFT GUIDANCE, *supra* note 374, at 13.

377. *Id.* at v.

378. *Id.*

379. DEC Press Release, *supra* note 372; *see also*, e.g., N.Y. DEP’T OF TRANSP., NEW YORK STATE BRIDGE MANUAL § 3.2.3.1, at 3-10 (5th ed., 2017) [hereinafter NYS BRIDGES MANUAL] (incorporating medium and high sea-level rise projections into hydraulic design considerations for certain bridges in coastal areas).

380. NYS BRIDGES MANUAL, *supra* note 379, §§ 1.1–1.2, at 1-1.

381. DEC Press Release, *supra* note 372.

382. *See*, e.g., CARMIN ET AL., *supra* note 24, at 20–24 (approximately 90% of U.S. cities surveyed reported that securing funding for adaptation is a challenge).

383. *See* Grannis et al., *supra* note 102, at 61 (exploring the challenges posed by coastal development in Connecticut).

384. *See* Evan Hjerpe et al., *Forest Density Preferences of Homebuyers in the Wildland-Urban Interface*, 70 FOREST POL’Y & ECON. 56, 63-64 (2016) (study of home sale prices in western dry, mixed conifer WUI of the United States, showing forest density at 500 meters to homes is positively associated with house values); *see generally* Richard Turner Henderson, Note, *Sink or Sell: Using Real Estate Purchase Options to Facilitate Coastal Retreat*, 71 VAND. L. REV. 641, 655 (2018) (discussing reticence local governments to pursue retreat strategies, “especially those [local governments] that profit from high property taxes and tourism”).

385. *Cf.* MULTHAZARD MITIGATION COUNCIL, NATURAL HAZARD MITIGATION SAVES: AN INDEPENDENT STUDY TO ASSESS THE FUTURE SAVINGS FROM MITIGATION ACTIVITIES 5 (2005), (reporting in 2005 that, on average, each dollar spent on hazard mitigation (i.e., adaptation) saves society \$4 in avoided future losses).

ters, and the effects of these resources on other property values in the area;³⁸⁶ public health costs;³⁸⁷ as well as the potentially astronomical costs associated with climate-related disasters.³⁸⁸ The reality is that maladaptive development has both immediate and long-term economic costs.³⁸⁹ For example, a 1999 report concluded that Seattle's loss of tree canopy cover over an approximately 25-year period increased the city's annual stormwater control costs by approximately \$1.3 million and cost the city approximately \$226,000 in additional annual healthcare costs related to air pollution.³⁹⁰ Another report estimated that Seattle's trees increase assessed property valuation by up to \$630 million, increasing the city's property tax revenues approximately \$131 million.³⁹¹

Notwithstanding the significant, immediate (and long-term) economic benefits associated with adaptive development, many local governments face real and perceived³⁹² economic pressure to intensify land uses in vulnerable areas and allow

386. N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 7 (finding that “[n]atural shoreline features, such as wetlands, aquatic vegetation, dunes and barrier beaches, currently provide large-scale services, such as flood protection, storm buffering, fisheries habitat, recreational facilities and water filtration, at almost no cost,” and “[t]hese services would be prohibitively expensive to replicate with human-built systems”); see also *Bartlett v. Zoning Comm’n*, 282 A.2d 907, 911 (Conn. 1971) (recognizing wetlands as “vital economic resources” that provide recreational benefits, wildlife shelters, and help to maintain property values, but nevertheless finding ordinance that prohibited development of property constituted a taking).

387. See also LUCAS DE MONCUIT, CARBON CITIES CLIMATE REGISTRY: 2013 ANNUAL REPORT 21 (2014) (“Current data reveal that supporting the green urban economy and improving urban air quality are the most common co-benefits of mitigation actions while improving public health is seen as a co-benefit for 18% of adaptation actions.”); Keith H. Hirokawa, *Sustaining Ecosystem Services Through Local Environmental Law*, 28 PACE ENVTL. L. REV. 760, 791–92 (2011) (discussing public health costs of reduced tree canopy in Seattle).

388. See N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 41:

Protecting development at high risk of coastal flooding thus far has come at great expense to the taxpayers of New York State. In the last five years alone, the state spent more than \$22.6 million in projects to protect public infrastructure, and commercial and residential property from erosion and flooding in coastal areas.

Id.; STRONGER, MORE RESILIENT, *supra* note 203, at 40 (finding implementation of certain adaptation measures could reduce expected losses in a Sandy-like storm in the 2050s by up to 25%, or more than \$22 billion).

389. See Hirokawa, *supra* note 387, at 791–92 n.101 (The loss of urban forest canopy “amounted to approximated \$1.3 million annually in stormwater control and \$226,000 in healthcare costs related to air pollution.”).

390. *Id.* at 791–92.

391. *Id.* at 792 n.101.

392. See GEORGETOWN CLIMATE CTR., PREPARING OUR COMMUNITIES FOR CLIMATE IMPACTS: RECOMMENDATIONS FOR FEDERAL ACTION 6 (2014), <http://www.georgetownclimate.org/files/report/GCC%20-%20Recommendations%20for%20Federal%20Action%20-%20September%202014.pdf> (“barriers [to leveraging federal programs to promote adaptation] are often more perceived than real”).

existing maladaptive land uses to remain.³⁹³ These pressures can be particularly acute in space-constrained municipalities where retreat to higher elevation locations simply is not possible because they do not exist or are already densely developed.³⁹⁴

It is difficult to assess at this early implementation stage whether the New York scheme provides sufficient resources to help local governments overcome real and perceived fiscal constraints of comprehensive adaptation. That said, the New York scheme does include provisions responsive to local fiscal constraints.³⁹⁵

The CRRA incentivizes local government adaptation considerations by making seven sources of state funding that existed before the law was enacted contingent on consideration of sea level rise, storm surges, and flooding “based on available data predicting the likelihood of future extreme weather events, including hazard risk analysis data if applicable.”³⁹⁶ These amendments require applicants, including local governments, to consider flood risk in their applications, but do not expressly provide any additional sources of funding to help pay for the costs of mitigating the flood risks the applicants identify.³⁹⁷ Thus, this part of the New York scheme may do little to remedy local fiscal constraints. However, by adding this requirement to the criteria for existing funding sources, this part of the scheme may have the effect of increasing local government applications for climate resilience projects (or projects designed to have climate resilience co-benefits)³⁹⁸ and increasing the likelihood that such projects will receive funding—although it is too early in the implementation of the CRRA to evaluate this.³⁹⁹

For example, the addition of flood risk considerations to funding criteria under the state’s water pollution control law⁴⁰⁰ may increase the likelihood of local

393. Hirokawa, *supra* note 387, at 792 n.101.

394. See GRANNIS, *supra* note 114, at 13 (recognizing that decision makers may choose protection strategies over retreat strategies when the area is densely developed).

395. See *infra* notes 398–415 and accompanying text.

396. See *supra* notes 258–64 and accompanying text.

397. *Id.*

398. “Co-benefits” in this context refers to increases in climate resilience that result from a project where the primary goal of the project is something other than climate resilience, such as, for example, the construction of a waste water treatment plant. In the climate change literature, however, the term co-benefits often refers to positive effects on human health or the environment that arise from interventions to reduce emissions climate-altering pollutants. See, e.g., K.R. Smith et al., *Human Health: Impacts, Adaptation, and Co-Benefits*, in IPCC, CLIMATE CHANGE 2014: IMPACTS, ADAPTATION, AND VULNERABILITY CONTRIBUTION OF WORKING GROUP II TO THE FIFTH ASSESSMENT REPORT OF THE INTERGOVERNMENTAL PANEL ON CLIMATE CHANGE 715 (2014), https://www.ipcc.ch/pdf/assessment-report/ar5/wg2/WGIIAR5-Chap11_FINAL.pdf.

399. In 2017, DEC finalized the regulations that establish the statewide sea-level rise projections. N.Y. COMP. CODES R. & REGS. tit. 6, part 490 (2017). See also *supra* note 348 (regarding implementation status of model local laws), and *supra* notes 371–84 (regarding implementation status of guidance documents).

400. N.Y. ENVTL. CONSERV. LAW § 17-1909(1)(d)(ii)(e) (McKinney 2018).

governments applying for and receiving funding for water quality projects, including green infrastructure projects, specifically designed to increase flood resilience or with flood resilience co-benefits. The CRRRA amended the criteria for funding determinations under the state's water pollution control law⁴⁰¹ to make "eligible project" status for purposes of entering into a State Water Pollution Control Revolving Fund agreement contingent on the applicant demonstrating that the design and construction of the project considered sea level rise, storm surge, and flood risk.⁴⁰² Although the Revolving Fund is primarily for municipal wastewater treatment plants and the treatment of nonpoint source water pollution,⁴⁰³ Revolving Fund projects can include "any activity whose purpose and design is the preservation, protection and/or improvement of water quality, or which implements green infrastructure, water or energy efficiency improvements or other environmentally innovative activities, . . . or which implements activities in an approved EPA national estuary management plan."⁴⁰⁴

Similarly, by adding flood risk considerations to the funding criteria for public infrastructure projects,⁴⁰⁵ coastal rehabilitation projects,⁴⁰⁶ and locally-led agricultural and farmland protection activities,⁴⁰⁷ local governments may find it easier to access state funds for climate-resilience projects related to these programs. Thus, in these three areas—as well as projects related to water quality,⁴⁰⁸ drinking water supply facilities,⁴⁰⁹ and closure of municipal landfills⁴¹⁰—which cover a broad ar-

401. *Id.*

402. 2014 N.Y. Laws 1116.

403. N.Y. ENVTL. CONSERV. LAW § 17-1909(1)(d) (McKinney 2018) (defining eligible projects as projects eligible for financing under the Federal Water Pollution Control Act, 33 U.S.C. §§ 1251-1388 (2012)).

404. 6 N.Y. COMP. CODES R. & REGS. § 649.2(a)(51) (McKinney 2018).

405. *Supra* note 258.

406. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW §§ 54-1105(1) & (5) (McKinney 2008)) (adding consideration of "future physical climate risk due to sea level rise, and/or storm surges and/or flooding" as a condition on DEC awards of state assistance payments for coastal rehabilitation projects). Pursuant to this amendment, the DEC Commissioner is authorized to award state assistance payments to municipalities and not-for-profit corporations for the lesser of fifty percent or two million dollars for coastal rehabilitation projects, provided that the Commissioner determines that "future physical climate risk due to sea level rise, and/or storm surges and/or flooding . . . has been considered." *Id.*

407. 2014 N.Y. Laws 1117 (amending N.Y. AGRI. & MKTS. LAW § 325(2)(f) (McKinney 2015)) (requiring that, in evaluating applications for funding, DEC "shall consider" whether future sea level rise, storm surge or flooding "has been considered"). Under this provision of the Agriculture and Markets Law, municipalities, counties, soil and water conservation districts, and not-for-profit conservation organizations may apply for state assistance payments to prepare or implement an agricultural or farmland protection plan. N.Y. AGRI. & MKTS. LAW § 325.

408. *See supra* notes 122–26 and accompanying text.

409. 2014 N.Y. Laws 1118 (amending N.Y. PUB. HEALTH LAW § 1161 (McKinney 2012)) (amending list of factors New York State Department of Health must consider in establishing system for ranking priority of public water system projects eligible to receive financial assistance from the Drinking Water Revolving Fund).

ray of programs and locations throughout the state, the CRRA may help address local resource gaps.

Finally, one provision of the CRRA expressly provides funding for local climate-resilience initiatives.⁴¹¹ The CRRA amended the Environmental Conservation Law to clarify that climate-resilience initiatives in the context of projects undertaken pursuant to, or in development of, local waterfront revitalization program (LWRPs)⁴¹² projects are included among the LWRP projects the DOS may support through state assistance payments or technical assistance.⁴¹³ LWRP projects eligible for CRRA funding include construction projects, and preparation of new local laws, plans, and studies.⁴¹⁴

LWRPs are local programs authorized by state law under a state coastal management program (CMP).⁴¹⁵ Upon approval by the state and the U.S. Secretary of Commerce, an LWRP becomes part of the state's CMP unless the state has given local governments a more limited role by requiring only that local actions be consistent with the state CMP.⁴¹⁶ Several states, including New York, incorporate local government plans into their state CMPs.⁴¹⁷ Under New York's CMP, any local

410. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW § 54-0503(3) (McKinney 2008)) (amending eligibility requirements for state assistance payments for municipal landfill closure projects to add to criteria a requirement that the closure investigation report include "a demonstration that future physical climate risk due to sea level rise, and/or storm surges and/or flooding" has been considered).

411. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW § 54-1101(1) (McKinney 2008)). Note that other state programs, not mandated by the CRRA, also provide funding for local climate-resilience initiatives. *E.g.*, DEC Press Release, *supra* note 372 ("Through Resilient NY, the State is also providing funding to support local resiliency planning and providing emergency flood-response training for communities across the state.").

412. *Supra* note 411.

413. 2014 N.Y. Laws 1117 (amending N.Y. ENVTL. CONSERV. LAW § 54-1101(1) (McKinney 2008)). This is the only provision in the CRRA that is not specifically limited to sea level rise, storm surge or flooding. However, the omission appears inadvertent given that the next provision in Section 10 added to the list of contractual requirements that DOS must impose on a municipality that receives state assistance payments toward the development of its LWRP a requirement that the municipality demonstrate it considered "future physical climate risk due to sea level rise, and/or storm surges and/or flooding."

414. N.Y. ENVTL. CONSERV. LAW § 54-1101(1) (McKinney 2017).

415. In New York, LWRPs are authorized by the state's Waterfront Revitalization of Coastal Areas and Inland Waterways Act, N.Y. EXEC. LAW §§ 910-923 (2015), which stems from the federal Coastal Zone Management Act, 16 U.S.C. §§ 1451-1464 (2018). The implementing regulations of the New York statute and coastal area policies can be found in the Department of State regulations, N.Y. COMP. CODES R. & REGS. tit. 19, § 600 (2018). *See generally* 4 PATRICIA E. SALKIN, AMERICAN LAW OF ZONING § 36A:10 (5th ed., 2018); 1 PATRICIA SALKIN, NEW YORK ZONING LAW & PRACTICE § 9B:11 (2017).

416. *See* 4 PATRICIA E. SALKIN, AMERICAN LAW OF ZONING § 36A:13 (5th ed., 2018).

417. *See, e.g.*, N.Y. EXEC. LAW §§ 910-920 (McKinney 2018), as amended at Act of July 21, 1986 1986 N.Y. Laws 2237; *see* OR. REV. STAT. § 197.015(5), (8) (2018); OR. DEP'T OF LAND CONSERVATION DEV., A CITIZEN'S GUIDE TO THE OREGON COASTAL ZONE MANAGEMENT PROGRAM, (2001) <https://www.oregon.gov/LCD/docs/publications/citznigid.pdf>; Shoreline Manage-

government (or two or more local governments acting jointly) that has any portion of its jurisdiction contiguous to the state's coastal waters or inland waterways may submit an LWRP to the New York Secretary of State.⁴¹⁸ An LWRP that has been approved by the Secretary of State entitles the local government to certain benefits, including financial assistance.⁴¹⁹

2. Moving Incrementally Toward a Holistic State Scheme

As the state has begun to implement its adaptation scheme, it appears the CRRA was an initial step in a series of incremental steps that, together, may help local governments overcome some of the most wicked features of the climate resilience problem.

a. Clarifying that the State Environmental Review Statute Requires Consideration of Climate Vulnerabilities

One way that state laws can support local government adaptation lawmaking is to clarify that the state's environmental review statute (if the state has one), like the National Environmental Policy Act (NEPA),⁴²⁰ requires consideration not only of the effect of a proposed action on climate change, but also requires consideration of the effects of climate change on the proposed action. Although a number of states have begun to include consideration of climate change in state environmental reviews, state statutes are typically silent on the issue.⁴²¹ From the face of the Act, the CRRA appears to have missed this opportunity.⁴²² But, in June 2018, DEC amended its SEQRA rules to clarify that consideration of climate change in the context of state environmental reviews includes not only consideration of the pro-

ment Act of 1971, WASH. REV. CODE ANN. § 90.58 (2018); *Coastal and Shoreline Management*, WASH. ST. DEP'T. OF ECOLOGY, <https://ecology.wa.gov/Water-Shorelines/Shoreline-coastal-management/> (last visited Oct. 22, 2018).

418. N.Y. EXEC. LAW § 915(1) (McKinney 2013).

419. *Id.* § 916.

420. 42 U.S.C. §§ 4321 to 4370m-12 (2012). *See also* COUNCIL ON ENVTL. QUALITY (CEQ), FINAL GUIDANCE FOR FEDERAL DEPARTMENTS AND AGENCIES ON CONSIDERATION OF GREENHOUSE GAS EMISSIONS AND THE EFFECTS OF CLIMATE CHANGE IN NATIONAL ENVIRONMENTAL POLICY ACT REVIEWS (released Aug. 2, 2016), https://obamawhitehouse.archives.gov/sites/whitehouse.gov/files/documents/nepa_final_ghg_guidance.pdf (clarifying that NEPA requires that environmental reviews take into consideration effects of proposed actions on the climate and effects of future climate change on proposed actions), *rescinded by* Presidential Executive Order on Promoting Energy Independence and Economic Growth, Exec. Order No. 13,783, 82 Fed. Reg. 16,093 (Mar. 28, 2017).

421. *But see* Lara D. Guercio, *Climate Change Adaptation and Coastal Property Rights: A Massachusetts Case Study*, 40 B.C. ENVTL. AFF. L. REV. 349, 374–79 (2013) (discussing Massachusetts Global Warming Solutions Act's adaptation-related provisions, including Mass. Gen. Laws Chapter 30, section 61, which requires consideration of climate change).

422. *See* 2014 N.Y. Laws 1115-18.

ject's contribution to climate-change drivers like greenhouse gas emissions but also "the project's vulnerability or resiliency to the effects of climate change, which in turn may affect the nature or significance of a project's environmental impacts."⁴²³ The amendment therefore clarifies that SEQRA mandates consideration of "how climate change may alter a project's environmental impacts during the lifetime of that project."⁴²⁴

Because SEQRA applies to local land use decisions,⁴²⁵ amendment of the SEQRA regulations may turn out to be one of the most effective features of the state's adaptation regime. As is the case in six other states,⁴²⁶ New York's environmental review statute applies to local government actions.⁴²⁷ Consequently, amendment of the state's "mini-NEPA" requires local governments to do adaptation reviews when they adopt or amend local zoning laws and comprehensive plans and when they issue decisions on applications for site plan or subdivision approval, variances, and special permits.⁴²⁸

The clarification that SEQRA requires consideration of resilience filled a significant gap in the CRRRA scheme. Notwithstanding the impact of local government land use decisions on climate resilience, the CRRRA does not directly require local governments to consider or mitigate climate-related risks;⁴²⁹ rather, the CRRRA indirectly affects local government decision-making by requiring consideration of future climate-related risks in a host of state permitting⁴³⁰ and funding decisions⁴³¹ and by encouraging local governments to consider future climate risks by mandating the creation by DEC and DOS of decision-support tools that help facilitate local governments consideration of future climate risks.⁴³² Thus, the SEQRA

423. N.Y. STATE DEPT. OF ENVTL. CONSERVATION, STATE ENVIRONMENTAL QUALITY REVIEW ACT: FINDINGS STATEMENT FOR AMENDMENTS TO 6 NYCRR PART 617, at 24 (2018), https://www.dec.ny.gov/docs/permits_ej_operations_pdf/617fnlfindings.pdf [hereinafter FINDINGS STATEMENT].

424. N.Y. STATE DEPT. OF ENVTL. CONSERVATION, FINAL GENERIC ENVIRONMENTAL IMPACT STATEMENT ON THE PROPOSED AMENDMENTS TO THE REGULATIONS THAT IMPLEMENT THE STATE ENVIRONMENTAL QUALITY REVIEW ACT, 6 NYCRR PART 617, at 148 (2018) [hereinafter SEQRA AMENDMENT FGEIS]. The amendment adds a new subsection (h) to N.Y. COMP. CODES, R. & REGS. tit. 6, § 617.9(b)(5)(iii) (2018). See N.Y. STATE DEPT. OF ENVTL. CONSERVATION, FINAL EXPRESS TERMS 2018 AMENDMENTS TO 6 NYCRR PART 617, 32-33 (2018), https://www.dec.ny.gov/docs/permits_ej_operations_pdf/617fnlexprms.pdf [hereinafter FINAL EXPRESS TERMS 2018 AMENDMENTS].

425. See N.Y. STATE DEPT. OF ENVTL. CONSERVATION, THE SEQRA HANDBOOK 179-86 (3d ed. 2010).

426. DANIEL R. MANDELKER ET AL., NEPA LAW AND LITIGATION § 12:2 (2d ed. 2018).

427. THE SEQRA HANDBOOK, *supra* note 425, at 179.

428. *Id.* at 179-86.

429. See 2014 N.Y. Laws 1115-18.

430. See *supra* Part IIA.

431. See *id.*

432. See *supra* Part IIB.1.

rule amendment added a direct mandate to local governments that will work in concert with the decision-support tools and incentives the CRRRA provides.

This amendment to the SEQRA regulations also added another key feature to the state's adaptation scheme: required mitigation of hazards.⁴³³ Unlike NEPA, SEQRA is both a procedural and substantive law.⁴³⁴ In addition to its procedural requirements, SEQRA mandates that agencies act on the substantive information produced in the environmental review by requiring project modification or denial if adequate mitigation of adverse impacts or a reasonable alternative is not available.⁴³⁵ Thus, the amendment "require[s] lead agencies, when preparing [environmental impact statements] for development projects to consider adaptive measures that will lessen the impacts that the project will have on the environment as a result of the effects of climate change, and to reduce vulnerability of the project to the effects of climate change."⁴³⁶

A clear requirement in state law that local governments consider and, where possible, mitigate future climate risks in land use related decisions could be controversial in home-rule states like New York.⁴³⁷ Case and statutory law over the past several decades, however, "indicate that local 'home rule' authority [in New York] is neither a legal nor a political barrier to effective land use legislation in the broader state interest."⁴³⁸ Additionally, a requirement that local governments consider and, where possible, mitigate future climate risks could give local governments some of the political cover they need to curtail development in the most vulnerable areas of their communities.⁴³⁹

b. Entrenching and Expanding Support for Resilience Policies

The amendment of the SEQRA regulations provides a helpful model with respect to how the substance of state law can help support local resilience govern-

433. THE SEQRA HANDBOOK, *supra* note 425, at 3, 5–6 (regarding SEQRA's mitigation requirements).

434. *Id.* at 3.

435. *Id.*

436. SEQRA AMENDMENT FGEIS, *supra* note 424, at 147.

437. See *Kalodimos v. Vill. of Morton Grove*, 470 N.E.2d 266, 274 (Ill. 1984):

Home rule . . . is predicated on the assumption that problems in which local governments have a legitimate and substantial interest should be open to local solution and reasonable experimentation to meet local needs, free from veto by voters and elected representatives of other parts of the State who might disagree with the particular approach advanced by the . . . locality involved or fail to appreciate the local perception of the problem.

Id.

438. John R. Nolon, *The Erosion of Home Rule Through the Emergence of State-Interests in Land Use Control*, 10 PACE ENVTL. L. REV. 497, 501 (1993).

439. See GRANNIS ET AL., *supra* note 102, at 87-88 (discussing political difficulty of restricting development).

ance, especially when the state environmental review statute applies to local government actions.⁴⁴⁰ But, the process New York employed in adopting its adaptation scheme may provide an even more helpful model, given widespread socio-political resistance to limitations on development and to state interference in local governance of land use.⁴⁴¹

One of the key features of the climate resilience problem is a tendency to give greater weight to immediate interests, discount future threats, and delay behavioral changes⁴⁴²—three attributes that are particularly wicked when time is costly.⁴⁴³ To overcome these attributes of super wicked problems, Levin suggests that policy-makers address three diagnostic questions when addressing super wicked problems: “What can be done to entrench support over time?”; “what can be done to expand the population that supports the policy?”; and “what can be done to create stickiness making reversibility immediately difficult?”⁴⁴⁴ Levin asserts that addressing the first two questions is a “prerequisite” because these questions must be resolved to develop the path dependency⁴⁴⁵ necessary to address super wicked problems, while addressing the third question is “useful” because it “[b]uys time,” but is not a prerequisite “as long as increasing support over time kicks in quite quickly.”⁴⁴⁶

Focusing on entrenchment and expansion, Levin argues that small policy changes can trigger path-dependent processes that can gain durability and expand over time.⁴⁴⁷ They argue that this approach has at least two benefits over one-shot approaches that focus on creating immediate stickiness.⁴⁴⁸ First, to create immediate stickiness, a policy would have to include features that make it difficult to undo and would as a result be subject to attack as anti-democratic.⁴⁴⁹ Second, such a policy would likely entail a large shift from the status quo, an approach that tends to be met with resistance.⁴⁵⁰ Ultimately, rather than focusing on one-shot policy

440. See *supra* Part II.B.2.a.

441. See *infra* notes 457–72 and accompanying text.

442. See *infra* note 452 and accompanying text (discussing temporal free-rider problem).

443. See *supra* Part II.B.1.

444. Levin et al., *supra* note 151, at 129.

445. See JONES & BAUMGARTNER, *supra* note 32, at 49 (“The general phenomenon of policies reproducing themselves through time is known as path dependency. Once a path is chosen, it tends to be followed. Moving off the path can be difficult.” (citation omitted)).

446. Levin et al., *supra* note 151, at 130.

447. *Id.* at 125.

448. *Id.*

449. *But see* Lazarus, *supra* note 152, at 1195–1204 (discussing and rejecting antidemocratic critique of policies that create stickiness).

450. Levin et al., *supra* note 151, at 125:

[O]ne-shot ‘big bang’ policies for super wicked problems, which require behavioral change by all relevant populations immediately, either fail to garner adequate support or, in those rare cases where such policies are adopted, are likely to produce societal ‘shocks’ that hamper implementation and compliance, derailing a policy no matter how well designed.

changes (whether they create stickiness or not), Levin suggests that focusing on norms, values, and coalition building can “unleash[] path-dependent trajectories.”⁴⁵¹ An approach to shifting policy equilibria by changing norms and values also finds support in a growing body of research that suggests that emotional responses to risk are an important component of rational risk regulation.⁴⁵²

However, given the time-is-running-out nature of super wicked problems,⁴⁵³ approaches that expand and entrench support incrementally must nevertheless be capable of changing behavior quickly. Additionally, given that partial solutions tend to exacerbate super wicked problems,⁴⁵⁴ a slow or stalled incremental adaptation scheme may fail to decrease hazards or even increase hazards.⁴⁵⁵ This may be why Churchman referred to partial solutions of super wicked problems as “immortal.”⁴⁵⁶

New York appears to have adopted an approach that avoids these obstacles. New York has employed an incremental process—by convening a task force, issuing a task force report, adopting an adaptation statute, adopting state risk projections, amending its SEQRA rules, promulgating floodplain and other related guidance documents and regulations, and (soon) issuing local model laws. Additionally, rather than slowly responding to gaps in the CRRRA scheme, New York moved quickly to promulgate complimentary rules and guidance such as the July 2018 amendment of the SEQRA regulations.⁴⁵⁷ Indeed, the CRRRA legislation itself was not even the first step in this incremental approach. The CRRRA was a legislative response to a report issued in 2010 by the legislatively created New York Sea Level Rise Task Force.⁴⁵⁸ By requiring applicants for certain permitting and funding programs to consider “flooding, storm surge, and sea level rise,” and by mandating that the state promulgate risk projections, the CRRRA then put in place requirements that formed, at least partially, the basis for the SEQRA amendment.⁴⁵⁹ As the final Generic Environmental Impact Statement observed:

Id.

451. *Id.*

452. Dan M. Kahan, *Two Conceptions of Emotion in Risk Regulation*, 156 U. PA. L. REV. 741, 744 (2008).

453. *See supra* Part II.B.1.

454. *See supra* Part II.B.2.

455. *See supra* notes 174–82 and accompanying text (discussing perverse consequences of partial solutions under NFIP) and notes 193–94 and accompanying text (discussing perverse consequences of partial solutions at municipal level).

456. Churchman, *supra* note 148, at B-142.

457. *See* FINAL EXPRESS TERMS 2018 AMENDMENTS, *supra* note 424, § 617.1(c) (stating that the agencies of New York should “incorporate consideration of environmental factors into the existing planning . . . at the earliest possible time”); *see also supra* notes 423–42 and accompanying text (discussing amendment to the SEQRA regulations).

458. *See* N.Y. STATE SEA LEVEL RISE TASK FORCE, *supra* note 271, at 8.

459. *See* SEQRA AMENDMENT FGEIS, *supra* note 424, at 149.

There will be substantial overlap between projects that will undergo scoping under SEQRA and those that will require permits covered under CRRA. As a result, the Department agrees that this new provision [of the SEQRA regulations] in Part 617 will work well with the recently adopted [risk projections in] Part 490. Any project proposed to be located in an area affected by sea level rise will be able to utilize the projections in Part 490.⁴⁶⁰

The SEQRA amendment also implemented a recommendation of the NYS2100 Commission, a commission convened by the governor in the aftermath of Hurricane Sandy to examine and evaluate key vulnerabilities in the state's critical infrastructure systems.⁴⁶¹

c. Assessing Impediments to Robust Adaptation

To maximize the benefits of an adaptation scheme characterized by incremental changes in law, the state adaptation law could benefit from a multi-agency analysis of statutory and regulatory impediments to robust adaptation.⁴⁶² Such an analysis should be conducted as part of the review leading up to passage of a state adaptation law. At that stage, any analysis should consider whether existing state law poses a barrier to adaptation law and policymaking at the local level.⁴⁶³ This analysis could be a mandatory provision of the state adaptation law or a nonregulatory function fulfilled by a task force, commission, nonprofit, or academic institution.⁴⁶⁴

One feature of the CRRA that warrants further assessment is the law's failure to adopt the NY Sea Level Rise Task Force's recommendation that state law classify areas of significant risk and require risk reduction measures be implemented in those areas.⁴⁶⁵ This gap in the law may be ameliorated partially by the SEQRA amendment, given SEQRA's applicability to land use decisions and its mitigation requirement.⁴⁶⁶

460. *Id.*

461. *Id.* at 147.

462. See Vicki Arroyo & Terri Cruce, *State and Local Adaptation*, in *THE LAW OF ADAPTATION TO CLIMATE CHANGE: U.S. AND INTERNATIONAL ASPECTS* 569 (Michael Gerrard & Katrina Fischer Kuh, eds., 2012).

463. See GRANNIS ET AL., *MODEL SEA LEVEL RISE OVERLAY ZONE*, *supra* note 292, at 6 (finding “[s]tate laws will likely pose the most significant barrier to adaptation” and state laws “may include some antiquated policies that could hinder or prohibit local adaptation efforts (such as grandfathering provisions that allow for the continuation of nonconforming uses)”).

464. See ASS'N OF STATE FLOODPLAIN MANAGERS, *NATIONAL FLOOD PROGRAMS & POLICIES IN REVIEW* 22 (2015) (noting “a lot” of work is being done by universities on data collection and adaptation preparation).

465. See N.Y. SEA LEVEL RISE TASK FORCE, *supra* note 271, at 8.

466. See *supra* Part III.B.2.a.

However, a requirement that local actions be subjected to environmental analysis that includes consideration of climate resilience is likely to produce case-by-case, fragmented assessments.⁴⁶⁷ A requirement that local governments consider climate resilience in their comprehensive plans would embed these climate resilience considerations into a planning process designed to formulate a community's vision of its long-term development.⁴⁶⁸ The comprehensive plan typically includes maps of present conditions, studies of population growth and development trends, and designates areas for future development and preservation, among other things.⁴⁶⁹ Moreover, most states require a municipality's zoning to be in accordance with its comprehensive plan.⁴⁷⁰

As New York continues to implement its adaptation scheme, an assessment of impediments should examine whether the New York scheme provides enough political cover and resources to local governments to facilitate effective risk assessment and mitigation at the local level.⁴⁷¹

CONCLUSION

State lawmaking provides an opportunity to shift maladaptive local law and policy. The solution to this super wicked problem requires recognition that effective engagement of local governments is critical to climate resilience. But, the solution also requires recognition that local autonomy and state mandates are not mutually exclusive. As Briffault's seminal pieces recognize, intractable obstacles to effective local governance can make the local power/local powerlessness dichotomy a false one.⁴⁷² Many local governments have the authority and tools to increase disaster resilience, and many are doing so by adopting innovative and effective accommodation strategies. But, without complimentary state lawmaking, even the most progressive and well-resourced local governments face intractable socio-political and technical barriers to adaptation strategies that involve restrictions on development. The result is that many communities in our nation's most vulnerable areas are continuing to allow or even promote development in these vulnerable areas, including coastal and other flood-prone areas and parts of the WUI.

467. Nolon, *supra* note 438, at 500.

468. GRANNIS, *supra* note 114, at 16.

469. *Id.*

470. Nolon, *supra* note 438, at 499.

471. See *supra* Part I.B (discussing super wicked attributes that stymie robust local resilience lawmaking).

472. See Briffault, *Our Localism I*, *supra* note 1, at 12:

The power of state legislatures to make laws with respect to local matters cannot be treated simply as an ongoing affront to local autonomy. Many state laws dealing with local matters are not antilocal, but respond to requests advanced by local interests or address matters affecting more than one locality.

Id.

Both the substance of New York's adaptation scheme, and New York's process of evaluating, adopting, and quickly building on that scheme, provide a model for other coastal states. New York's adaptation scheme and process also provide a useful case study for examining how state law can support local governments in overcoming impediments to robust adaptation to climate-related risks more generally. New York's promulgation of downscaled flood risk projections, model local laws (forthcoming), and implementation guidance recognize the essential role of local governments in increasing community resilience, and those governments' need for state support in responding to climate-related risks. In so doing, New York has expanded local government adaptive capacity by responding to critical resource gaps faced by local governments. New York has also taken an incremental approach to state adaptation lawmaking that has quickly expanded and entrenched support for climate adaptation governance. As part of that incremental approach, on the heels of passing the CRRA New York promulgated amended rules clarifying that its environmental review statute requires consideration of climate resilience. Because the state's environmental review act applies to local actions and requires mitigation, this feature of the state's adaptation scheme filled a critical gap in the CRRA. But, whether New York's approach provides enough incentive and resources to facilitate local governments adopting a balance of accommodation and retreat strategies commensurate with the vulnerability of their communities remains to be seen—especially given the CRRA's failure to require designation of areas at significant risk or impose mandatory implementation of risk-reduction measures in such areas.