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INCREASING COASTAL COMMUNITY RESILIENCY THROUGH FACILITATED LAND USE TRAINING, ASSESSMENT, AND AMENDMENTS[1]

By Jessica A. Bacher and Tiffany B. Zezula[2]

Introduction

Recent extreme weather events have highlighted the need for a local approach to coastal resiliency. Over the past several decades, climate change has increased the frequency and strength of these events, including heavy downpours, flood events, and Atlantic hurricanes.[3] Hurricanes, in particular, have increased in intensity, frequency, duration, and the number of Category 4 and 5 storms.[4] Additionally, 233 weather and climate disasters have occurred in the U.S. since 1980, each with overall damages and costs of $1 billion or more, and combined costs from these events have exceeded $1.5 trillion.[5] Further, the National Oceanic and Atmospheric Administration (NOAA) National Climatic Data Center's Billion-dollar Weather/Climate Disaster report documents an increase of approximately 5% per year of these "billion-dollar disasters."[6]

At the local level, many communities are failing to respond to the risks associated with more frequent extreme weather events as they continue to build and rebuild in areas with increased exposure.[7] To mitigate and manage these risks, vulnerable communities should amend their land use policies, plans, and regulations in ways that increase resiliency of their coastal and low-lying areas.

Local land use policy, planning, and regulation offer a significant opportunity to create more resilient communities. Local land use authority is "the foundation of the planning that determines how communities

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and natural resources are developed and preserved, and how disaster resilient communities are created."[8] Local land use policies, plans and law control where and how buildings and other development are placed on a community's landscape. Zoning laws often have allowed landowners to build in coastal areas and floodplains that are now at heightened risk for hurricanes and other extreme weather events, but this trend can be reversed. Because the addition of substantial new building stock and infrastructure is anticipated over the next few decades, local governments that regulate the placement and, in some respects, design aspects of building stock and other infrastructure have an opportunity to avoid locking in development and infrastructure that increases flood and other climate-related risks.[9]

To help guide anticipated development, municipalities would benefit from decision-support tools that could help them amend their existing land use plans, codes, and policies in a way that minimizes disaster-related risks and improves their marine community resiliency and coastal storm preparedness. Such decision-support tools may include models or web-tools that facilitate coastal, riverine, and estuarine communities in assessing and amending their policies, plans, and zoning codes to increase resilience. In 2017, the Environmental Protection Agency (EPA) and Federal Emergency Management Agency (FEMA) partnered to create the *Community Resilience: Implementation and Strategic Enhancements (C-RISE) Local Assessment Tool*,[10] a decision-support tool that helps communities assess how their existing plans, codes, and policies currently support resilience. The C-RISE Local Assessment Tool then helps these communities identify planning and regulatory strategies they can implement to improve coastal storm preparedness and resiliency.

This article describes how, with authentic community engagement and local champions armed with technical knowledge, communities can use the C-RISE Local Assessment Tool to create a plan for implementing resiliency strategies. The article begins by describing the C-RISE Local Assessment Tool, as well as the Pace Law School's Land Use Law Center and its Land Use Leadership Alliance Training Program (LULA), which identifies and provides local leaders with the technical and facilitation expertise they will need to successfully lead a local resiliency initiative. The article then presents a case study from a Long Island Town that participated in the LULA program and used the C-RISE Local Assessment Tool to create an action agenda for implementing C-RISE strategies within its community. Finally, the article concludes by exploring how municipalities have implemented other resiliency strategies throughout the U.S.

Community Resilience: An Implementation and Strategic Enhancements Assessment Tool for Municipalities

As extreme weather events have increased in intensity and frequency, municipalities at risk have begun to respond by amending their land use plans, codes, and policies to become more resilient; however, these communities often encounter challenges with understanding and assessing their current land use practices as they make these changes. To assist communities with this process, the Environmental Protection Agency (EPA) and Federal Emergency Management Agency (FEMA) partnered to create the *Community Resilience:*

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Implementation and Strategic Enhancements (C-RISE) Local Assessment Tool.[11] Municipalities can use the C-RISE Local Assessment Tool to help incorporate resilience into their land use plans, regulations, and policies in part by breaking down typical planning silos to create cross-dialogue between departments, staff, and boards.

As a first step to using the tool, a community forms a steering committee or review group with three to six (or more) members with access to key community information and who can serve as ongoing champions of building resilience. The steering committee should include local officials, staff, and board members; federal or state agency personnel; and representatives from local interest groups and organizations. This participation ensures access to necessary baseline information and helps secure buy-in from local officials, as well as community support.

Once formed, the steering committee can use the C-RISE Local Assessment Tool to guide the community through a comprehensive and collaborative assessment of the current status of their local land use approach to resiliency and to help them determine changes they can make to improve resiliency. The tool helps answer two questions: (1) What are the gaps in local policies and regulations that support resilience, and (2) How can the community successfully integrate resilience-enhancing measures into its existing land use laws, building codes, and planning policies? To identify policy and regulation gaps, the tool helps a community complete an audit of its existing land use plans, codes, and policies by comparing them to the following seven Resilience Goal Areas that:

1. Ensure comprehensive understanding of known hazards and their potential effects (physical, economic, social).

2. Conserve land in critical coastal areas, river corridors, and other hazard-prone environments.

3. Reduce risk to people, buildings, and facilities in vulnerable areas.

4. Plan for and encourage development in safer areas.

5. Implement comprehensive stormwater management techniques.

6. Improve the community capacity needed to enhance resilience.

7. Build community support for improving resilience and remove barriers to implementation.

Each Resilience Goal Area includes a definition describing how the goal builds resilience, as well as practical applications that highlight how specific communities have implemented these goals in action. Additionally, each Resilience Goal Area presents context-setting questions for the community to answer and a checklist of strategies to consider how the community currently or could (1) study, adopt plans, and educate; (2) remove barriers and build partnerships; (3) adopt incentives; and (4) enact policies and supportive regulations. Each Resilience Goal Area also includes targeted resources for these strategies. Following these goals, the tool presents prioritization guidance and an action planning exercise to help the community synthesize assessment results and conclusions.

After a community completes this assessment, it has a comprehensive understanding of how the community currently addresses resilience, its successes and strengths, and the gaps and challenges it must address. In addition, the tool presents the community with specific and applicable strategies, including land use planning and regulatory strategies, the community can implement to improve resilience.

The C-RISE Local Assessment Tool was developed to assist communities affected by coastal or riverine hazards, but any community can use the tool to become more resilient. The tool assumes participating communities have completed some preliminary visioning and planning steps to improve local resiliency. Municipalities should keep in mind that not all of the tool's goals and strategies will apply to every community.

Because the C-RISE Local Assessment Tool depends on local leaders and staff to champion resiliency efforts, communities must cultivate leaders interested in resiliency efforts before embarking on the C-RISE assessment.

Building the Human Infrastructure: Training and Education to Begin the Process

Even with access to a resource like the C-RISE Local Assessment Tool, localities will struggle to plan for and implement land use resiliency initiatives if they lack leaders with sound technical knowledge and understanding of the relevant issues, as well as the ability to build community support. In many communities, land use decisions have become a battleground that polarizes neighbors, frustrates developers, and paralyzes local officials. In addition, land use issues, especially those focused on creating resiliency, have become increasingly complicated, and it is often difficult for public officials to balance the competing forces of environmental protection, economic and sustainable development, and preservation of community character. To manage resiliency through land use strategies, the decision makers and stakeholders involved must have knowledge of and understand effective strategies and must have the capacity to build consensus.

At Pace Law School's Land Use Law Center, the Land Use Leadership Alliance Training Program (LULA) provides local leaders with the technical and facilitation expertise they will need to successfully lead a local resiliency initiative using the C-RISE Local Assessment Tool. The Center created the LULA program in 1995 to educate local leaders about land use law techniques and collaborative decision-making.[12] Each LULA brings together 40 local leaders for a three- to four-day training experience. The program employs an intense and deliberate process to recruit participants who are broadly respected, practical, and innovative and who will use the legal and procedural tools they acquire through LULA to catalyze effective change where they live. Participants represent varying backgrounds, hold diverse positions in communities, and reflect differing perspectives on how land should be utilized. Developers, real estate agents, mayors, supervisors, planning and zoning officials and board members, citizen advocates, business leaders, environmentalists, and housing advocates all have participated in the program.

At each day of training, participants engage in lecture-based learning, experiential learning, and unstructured, social interaction with other leaders, a program design that facilitates peer-to-peer interaction, the most effective approach to land use innovation.[13] Each LULA program teaches participants how to achieve solutions to complex, persistent land use problems through implementation of innovative land use techniques using authentically collaborative initiatives. The program models the creative thinking, problem solving, and conversation participants must facilitate and foster in their own community forums. Based on a "train the trainer" model, the LULA program empowers participants to share their program experience with others, encouraging the creation of leadership networks, initiating and supporting grassroots regionalism, creating opportunities for civic engagement, and fostering resilient communities. Since 1995, over 3,000 leaders across six states have graduated from the LULA program, and over 90% of graduates report implementing one or more of the techniques taught in the program.

In early 2016, the Center conducted a LULA program to help New York communities implement resiliency strategies using a collaborative process. Together with Touro Law Center, the Center held the LULA program for communities in the coastal region of Long Island. Local leaders from several coastal Long Island communities facing similar land use and resiliency issues attended the training program. With support from the New York Sea Grant, the Center continued the training in early 2017 and 2018.

The LULA program's curriculum covered the local land use system, innovative approaches to sea level rise adaptation, economic development, hazard mitigation, natural resource protection, and community engagement techniques to strengthen community planning, regulation, and informed decision-making. The program featured the C-RISE Local Assessment Tool, describing how participants could use this tool to audit their communities' existing resiliency initiatives and determine which resiliency strategies their local governments should implement. The LULA program aimed to help Long Island leaders create new networks of support, identify successful land use techniques, and develop implementable local strategies that would enable a more resilient future for their community. Once

trained by the LULA program, participants were ready to return home to implement these strategies and techniques. Below, this article describes how participants from one Long Island Town used the C-RISE Local Assessment Tool in their community.

Implementing the C-RISE Local Assessment Tool: A Town Case Study

In early 2017, under the championship of a local Supervisor who attended the LULA program along with his staff, the Center worked specifically with a Long Island Town, using the C-RISE Local Assessment Tool to audit the Town's existing resiliency efforts to prepare for, withstand, and respond to disaster events and to identify any gaps in or barriers to those efforts. The assessment began by convening a well-functioning and technical group of stakeholders to serve as a Steering Committee charged with reviewing and prioritizing the C-RISE Tool's goals and strategies. The Steering Committee included a diverse group of Town staff, all knowledgeable experts with access to the information required for the C-RISE assessment. Steering Committee members included the Town's Building Inspector, Environmental Analyst, Stormwater Manager, Principal Planner, Engineer, Highway Department Personnel, Town Attorney, and the Emergency Preparedness Coordinator.

The Steering Committee met several times over the course of a few months for facilitated dialogues with Center staff. At the Committee's first meeting, Center staff presented a completed C-RISE assessment of the Town's existing land use laws, building codes, and planning policies. This assessment identified resilience-enhancing measures currently integrated in the Town's laws, plans, and policies. Center staff walked the Committee through each C-RISE Resilience Goal Area, strategies the Town could use to attain each Goal Area, and references to the existing Town laws, plans, and policies that already implemented those strategies. During this process, the Steering Committee identified unused strategies that might be appropriate for the Town.

After reviewing the Town's C-RISE assessment, the Steering Committee selected the Resilience Goal Areas and related strategies most appropriate for the Town's specific circumstances and that would focus Town staff time and resources. The Committee prioritized the following C-RISE Resilience Goal Areas:

> 1. Ensure comprehensive understanding of known hazards and their potential effects (physical, economic, social).
>
> 3. Reduce risk to people, buildings, and facilities in vulnerable areas.
>
> 6. Improve the community capacity needed to enhance resilience.
>
> 7. Build community support for improving resilience and remove barriers to implementation.

The Committee then developed an action agenda based on these selected Goal Areas that included priority strategies. Staff used the C-RISE Tool's implementation worksheets, topic questions for consideration, best practice suggestions, and other resources to help develop the action agenda. Overall, the C-RISE Assessment process helped clarify, prioritize, and define roles and responsibilities and identify necessary resources for implementation of the priority resilience strategies in the Committee's action agenda. Several of these priority strategies are described below. These include strategies related to (1) data and planning, (2) the National Flood Insurance Program (NFIP) Community Rating System, and (3) local code amendments.

1. DATA AND PLANNING STRATEGIES

Data, maps, and planning documents are at the core of many resiliency strategies. The Town's C-RISE assessment highlighted the need for better data and improved integration of planning activities. For example, C-RISE Strategy 1.2 states that the comprehensive plan should identify the location of socially vulnerable populations (e.g., age, income and poverty, education, housing, race, disability, social isolation) relative to hazards and hazard-prone areas. The Town's existing comprehensive plan did not identify these locations. To complete this strategy, the Town must begin by collecting relevant data from the Center for Disease Control 2015 Social Vulnerability Index. This data includes locations of schools, hospitals, senior living facilities, and assisted living facilities. After obtaining this data, the Town must scale the data appropriately and overlay it with hazard-prone and

low-lying areas. This information should then be integrated into the Town's comprehensive plan and any relevant area plans. The Town can access two resources to help implement this strategy: the Federal Emergency Management Agency (FEMA)-sponsored step-by-step guide to conducting a social vulnerability hazard assessment[14] and the Center for Disease Control's Social Vulnerability Index, which analyzes a variety of risk factors at a census block level.[15]

The Town's action agenda also prioritized Strategy 7.13, which requires maintenance of the Town's current inventory of nonconforming structures located in the regulatory floodplain to prevent rebuilding in hazard areas in the event of significant damage. To update this inventory, the Town can use FEMA floodplain maps, create a GIS shapefile of nonconforming structures, and conduct an analysis that overlays the nonconforming structures on the floodplain. For help creating this inventory, the Town can access FEMA's guidance for hazard mitigation planning.[16] Both Strategy 1.2 and 7.13 highlight the importance of data and the need for sophisticated mapping tools and resources to better inform resiliency plans and decision making.

The C-RISE Assessment and selected strategies also highlight the need to integrate planning activities and breakdown silos within the Town to ensure the Town's hazard mitigation planning with the County takes into consideration the Town's general land use plans and vice versa. Several of the priority strategies in the Town's action agenda focus on hazard mitigation planning and this integrated planning. C-RISE Strategy 1.18 requires the Town to participate in an update to the County's hazard mitigation plan, Strategy 6.5 requires the local government planner or zoning administrator to help develop or update the community's hazard mitigation plan,[17] and Strategy 6.6 requires the Town to include groups that could be affected by floods in the hazard mitigation plan drafting process.[18] These groups may include local businesses, schools, hospitals and medical facilities, agricultural landowners, and water and wastewater utilities. Finally, Section 7.6 requires the hazard mitigation plan to identify projects that could be included in pre-disaster grant applications.

For general guidance on multi-jurisdictional mitigation planning, the Town can reference FEMA's Local Mitigation Planning Handbook;[19] the Governors' South Atlantic Alliance, through which the Governors of North Carolina, South Carolina, Georgia, and Florida have collaborated around ocean and coastal challenges and opportunities, including environmental sustainability and disaster preparedness;[20] and several other regional collaboration examples.[21]

Other priority planning strategies called for better coordination and integration of resiliency strategies with the Town's comprehensive plan. For example, C-RISE Strategy 1.1 requires the comprehensive plan and relevant area plans to include a hazard mitigation or resilience chapter or section. Additionally, Strategy 6.4 instructs municipalities to include emergency response personnel, the floodplain manager, public works personnel, the hazard mitigation planner, and the marine resources agent, or similar staff, when developing or updating a comprehensive plan or area plan. For assistance, the Town should consult FEMA and American Planning Association (APA) resources on integrating hazard mitigation into local comprehensive plans.[22]

Implementation, completion, and coordination of data, maps, and planning strategies will create a foundation for other selected resiliency strategies that require resource investment and regulatory changes. These priority strategies are discussed below.

2. NFIP COMMUNITY RATING SYSTEM (CRS) STRATEGIES

The Town also chose to prioritize C-RISE strategies focused on financial resources and economic impacts, so the Town's action agenda includes Strategy 3.8, which urges participation in the National Flood Insurance Program Community Rating System (CRS), as well as Strategy 3.10, which instructs the Town to develop a plan to increase CRS points to reduce insurance rates. CRS is a component of FEMA's National Flood Insurance Policy (NFIP) that is voluntary for communities, townships, cities, and counties.[23] CRS helps coastal communities finance flood insurance while

incentivizing communities to implement adaptation measures that mitigate flood hazards at the community level. It gives local authorities the flexibility to implement a comprehensive approach to floodplain management that is tailored to a community's specific needs. CRS provides premium discounts for communities that exceed the minimum floodplain requirements. Discounts are distributed through a tiered system, whereby communities accumulate points by implementing adaptation measures to qualify for a certain level of discounts.[24]

The Town is well positioned to participate in CRS but first must meet requirements pertaining to public information disclosure. Local jurisdictions that have attained national recognition as the most flood-prepared localities in the country have heavily invested time and resources to conduct public information programs that meet CRS requirements. Many have implemented innovative methods. For example, King County, Washington, conducted a comprehensive CRS public information disclosure program that includes:

- Maintaining and publicly disclosing information on FEMA elevation certificates, flood insurance rate maps, and insurance purchase requirements.
- Making all information available online and at a local public library.
- Mailing informative brochures to property owners who live in the coastal flood zone to inform them of the CRS program.
- Providing opportunities for walk-in inquiries for flood protection assistance at the Department of Permitting and Environmental Review.
- Disclosing flood hazards through public notices and real estate transactions.[25]

Similarly, Roseville, California, boasts the highest-rated CRS program in the nation, which featured a centralized, joint community event that facilitated public information disclosure.[26] Together with Sacramento, Roseville held the High Water Mark launch event on November 8, 2013 in a centralized location (Garcia Bend Park) in downtown, Sacramento. The public event educated the community about flood risk and mitigation, as representatives from multiple municipal agencies presented at the public event. After the event, a signpost indicating the County's high-water mark was erected.[27]

The nation's most successful CRS programs serve as helpful examples. The Town should consult these examples as it creates its own CRS public information disclosure program. For additional help, the Town should refer to FEMA's resource entitled, *Developing a Program for Public Information for Credit under the Community Rating System of the National Flood Insurance Program*.[28]

3. LOCAL CODE STRATEGIES

In addition to data, planning, and NFIP CRS strategies, the Town also chose to prioritize strategies for local code amendment in its action agenda. Almost 40 strategies in the C-RISE Local Assessment Tool relate to policy and code amendments that implement resiliency measures. The Town prioritized the three strategies below for code amendments. The Town will use the Model Local Laws Concerning Climate Risk (Model Laws) under development by NYS Department of State (DOS) for guidance on implementation.[29] These Model Laws must be based on available data predicting the likelihood of extreme-weather events, including hazard-risk analysis.

First, the Town prioritized C-RISE Strategy 3.23, which requires dry land access for new commercial or industrial facilities to ensure emergency personnel and employees can reach facilities in the event of a flood. Applied to existing floodplain regulations, this strategy would further reduce risk and protect floodplain functions. Suggested code language would regulate access (ingress and egress) to decrease the likelihood that residents could become stranded in their elevated homes and reduce the need for water rescues that place emergency responders at risk.

To attain this strategy, the Town proposes to amend its subdivision regulations using code language from the Model Laws to include a requirement to provide dryland access when it is readily

achievable. Contiguous dryland access should be provided from a proposed principal structure on residential and commercial property to land outside of the flood hazard area, when it is readily achievable. Dryland Access means a vehicular access route that is above the base flood elevation and that connects land located in the flood hazard area to land outside the area, such as a road with its surface above base flood elevation and wide enough for wheeled rescue and relief vehicles. The City of Whitewater, Wisconsin defines dryland access as "a vehicular access route which is above the regional flood elevation and which connects land located in the floodplain to land which is outside the floodplain, such as a road with its surface above the regional flood elevation and wide enough to accommodate wheeled vehicles."[30]

Due to severe impacts from Superstorm Sandy, the Town also prioritized Strategy 7.4, which recommends the adoption of a post-disaster redevelopment ordinance that prepares the community to efficiently manage recovery efforts after a declared disaster. To implement this strategy, the Town could adopt FEMA's Model Pre-Event Recovery Ordinance, which authorizes the establishment and maintenance of a recovery management organization to plan, prepare for, direct, and coordinate orderly a post-disaster recovery.[31] The Model Law would also direct the preparation of a pre-event recovery plan for short-term and long-term post-disaster recovery; grant emergency powers for staff action to ensure a timely and safe post-disaster recovery; identify ways the Town could work with other governmental entities to facilitate recovery; and specify how the Town could help citizens, businesses, and community organizations during recovery planning and implementation.[32] The Town is particularly interested in planning for debris removal, as it created a significant obstacle to post-storm recovery after Superstorm Sandy.

Lastly the Town's action agenda prioritized Strategy 3.14, which advises communities to adopt a plan or program for strategic acquisition (buyout) of repetitive-loss properties in hazard areas and to facilitate their reuse as open space and green infrastructure. To implement this strategy, the Town should begin by evaluating the number of properties that have experienced repetitive loss in the Town's hazard areas. Upon request, FEMA can provide the Town with a list of NFIP repetitive-loss properties. Once the Town evaluates the number of these properties located within the Town, it must determine the amount of resources necessary to convert these properties, develop a funding source, and create a system acquiring these properties and converting them to achieve open space and green infrastructure goals. The City of Portland, Oregon provides a helpful example. Portland's Environmental Services department administers the Johnson Creek Willing Seller Land Acquisition Program, which acquires land in areas that frequently flood by offering willing, volunteer sellers fair market value for their property.[33] Once purchased, deed restrictions are placed on these properties, designating them as open space in perpetuity and prohibiting the properties from benefiting from federal disaster assistance funds in the future. Once restored, acquired land contributes to increased flood storage, improved fish and wildlife habitat, restored wetlands, and passive recreational activities.

Other C-RISE Goals and Strategies

In addition to those described in the case study above, the C-RISE Local Assessment Tool advocates a number of other resiliency goals and strategies that municipalities have implemented throughout the U.S. For example, C-RISE Goal Area 2 is focused on conserving land in critical coastal areas, river corridors, and other hazard-prone environments. This goal encourages development outside of these sensitive areas to allow natural flood-reducing functions and to reduce risks to people and structures. Strategy 2.12 under this goal recommends conservation of open space and natural features using overlay zoning districts. For example, the Town of Chapel Hill, North Carolina adopted a Resource Conservation District (RCD) Ordinance that creates 150-foot corridors along all perennial streams, as well as 50-foot corridors along intermittent streams and perennial water bodies.[34] Within each corridor, the RCD Ordinance restricts permitted uses and activities to those compatible with water quality and habitat preservation, erosion and sedimentation prevention, and reduced flood risks to people and property.[35] Ad-

ditionally, within these established corridors, RCD replaces some of the underlying zoning's dimensional regulations with standards that contribute to these objectives.[36]

Similarly, Strategy 2.14 recommends establishing land use regulations that restrict tree and vegetation clearance. The City of New Rochelle, New York adopted impervious surface regulations requiring development projects that will create impervious surface or to expand any existing impervious surface by more than 200 square feet to obtain a permit from the Bureau of Buildings and to mitigate associated impacts as required.[37]

C-RISE Goal Area 4 urges communities to plan for and encourage development in safer areas by accommodating new growth in areas protected from hazard risks. Under this goal, Strategy 4.1 encourages local comprehensive plans to identify and designate areas safe for development as targeted growth areas. The City of Snoqualmie, Washington's comprehensive plan, Snoqualmie 2032, implements this strategy, guiding new growth to Snoqualmie Ridge, an area outside the floodplain, and away from the Historic Snoqualmie area, which is subject to prevalent floodplain constraints.[38]

Strategy 4.7 under Goal Area 4 encourages communities to adopt incentives, such as bonus density bonus incentives, to encourage development in safer areas. Bonus density incentives allow developers to build at greater development densities than permitted under existing zoning in exchange for providing one or more community benefits, such as off-site infrastructure or pubic, open space. The Town of Milliken, Colorado awards conservation density bonuses to rural subdivisions that conserve areas in the 100-year floodplain, wetlands, valuable habitat areas, and natural geologic hazard areas (as defined by the Colorado Geological Survey). The conservation density bonus increases maximum density for rural subdivisions from one unit per 20 acres to one unit per five acres.[39]

Finally, C-RISE Goal Area 5 encourages communities to implement comprehensive stormwater management techniques that slow stormwater flow, allowing time for infiltration onsite. The goal further encourages communities to adopt several systems that manage stormwater and to approach stormwater management from a regional or watershed perspective, as stormwater does not stop at municipal boundaries. Strategy 5.10 recommends offering incentives, such as tax abatements, fee waivers, and expedited permitting for developments that provide green infrastructure. The City of Philadelphia's Water Department (PWD) offers two expedited post-construction stormwater management plan (PCSMP) reviews for projects that include qualifying green infrastructure strategies.[40] Disconnection Green Review is available for certain redevelopment projects that disconnect 95% or more of the post-construction impervious area within the project's limits of disturbance (LOD) and only use disconnected impervious cover (DIC) to comply with Post-Construction Stormwater Management (PCSM) Requirements.[41] Eligible projects include residential and industrial projects with significant green roofs or porous pavement. Surface Green Review is available for new development and redevelopment projects with 100% of post-construction impervious area within the project's LOD managed by DIC or bioinfiltration/bioretention basins to comply with PCSM Requirements.[42]

Additionally, Strategy 5.13 encourages municipalities to require new development or redevelopment projects to meet stormwater performance standards, such as capturing and infiltrating onsite the first 1-1.5 inches of rain using green infrastructure practices. The City of Phoenix, Arizona's grading and drainage regulations include design standards for on-site stormwater retention that require all developments to retain on-site a volume of water defined in the latest edition of the City of Phoenix Stormwater Policies and Standards Manual in effect at the time of plan submittal.[43] The design standards prohibit all developments from increasing the 100-year, two-hour peak runoff, changing the time of the peak, or increasing total runoff from pre-development values.[44]

Municipalities can adopt these C-RISE resiliency goals and strategies, as well as those described in the case study above, to become more resilient. Recent extreme weather events have shown that weather-related disasters are becoming more frequent and affecting more communities yearly. With their authority and ability to plan for and

regulate land use, local governments are in a position to help their communities become more resilient by guiding where and how future development is built. Decision-support tools like the LULA and C-RISE Local Assessment Tool help local governments with this task by providing a framework for assessing a community's existing codes, plans, and policies and choosing appropriate strategies to amend them, thereby improving the community's local marine resiliency and coastal storm preparedness. With local leaders who are armed with technical and facilitation expertise spearheading these initiatives, communities can become more resilient and safer in the face of a changing climate.

ENDNOTES:

[2]Jessica Bacher is an Adjunct Professor of Law at Pace Law, Executive Director of its Land Use Law Center and Lecturer at Yale School of Forestry and Environmental Studies. Tiffany Zezula is an Adjunct Professor of Law at Pace Law and Deputy Director of its Land Use Law Center. Established in 1993, the Center is dedicated to fostering the development of sustainable communities and regions through the promotion of innovative land use strategies and dispute resolution techniques. The authors thank editorial consultant Meg Byerly Williams, University of Arkansas at Little Rock Associate Professor of Law Sarah Adams-Schoen, and student researchers Lindsay Willson, James Ward, and Bowen Chang for their contributions to this article.

[3]National Climate Assessment, U.S. Global Change Research Program, https://nca2014.globalchange.gov/highlights/report-findings/extreme-weather (last visited Oct. 5, 2018).

[4]*Id*.

[5]U.S. Billion-Dollar Weather and Climate Disasters, NOAA National Centers for Environmental Information, https://www.ncdc.noaa.gov/billions/ (last visited Oct. 5, 2018).

[6]*Id*.

[7]John Schwartz, *Humans are Making Hurricanes Worse. Here's how*, N.Y. Times (Sept. 19, 2019), https://www.nytimes.com/2018/09/19/climate/humans-hurricanes-causes-effects.html.

[8]John R. Nolon, Disaster Mitigation Through Land Use Strategies, in Losing Ground: A Nation on Edge 14 (John R. Nolon & Daniel B. Rodriguez eds., 2007), http://digitalcommons.pace.edu/lawfaculty/606/.

[9]John R. Nolon, *The Land Use Stabilization Wedge Strategy: Shifting Ground to Mitigate Climate Change*, 34 Wm & Mary Envtl. L. & Pol'y Rev. 6 (2009) (reporting that 66% of the buildings in existence in the United States by the year 2050 are projected to be built between now and then).

[10]EPA & FEMA, Community Resilience: Implementation and Strategic Enhancements (C-RISE) Local Assessment Tool (2017), on file with author.

[11]EPA & FEMA, Community Resilience: Implementation and Strategic Enhancements (C-RISE) Local Assessment Tool (2017), on file with author.

[12]Land Use Law Center, Pace Law School, Land Use Leadership Alliance Training Program https://law.pace.edu/land-use-leadership-alliance-training-program (last visited Sept. 25, 2018).

[13]*See* Everett M. Rogers, Diffusion of Innovations (5th Ed. 2003). Rogers noted that "[m]ost individuals evaluate an innovation not on the basis of scientific research by experts, but through the subjective evaluations of near-peers who have adopted the innovation. These near-peers thus serve as social models, whose innovation behavior tends to be imitated by others in their system." This theory extends to communities, as well. New patterns of development, building and site design, and local environmental laws are "innovations" that improve the land use system. New laws and practices that accomplish resilient and sustainable development demonstrate remarkable adaptation to contemporary needs and challenges created by climate change. But, when a community adopts these innovations and improves its pattern of land development, other communities only benefit if they learn about and implement the new approach themselves.

[14]UNC Institute for the Environment & MDC, Inc., Community Based Vulnerability Assessment: A Guide to Engaging Communities in Understanding Social and Physical Vulnerability to Disasters (2009), http://www.mdcinc.org/sites/default/files/resources/Community%20Based%20Vulnerability%20Assessment.pdf.

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