

## Local Governments put Adaptation on Their (Long) To-do Lists

“Resilience” is the word, as foundations, NGOs and federal agencies provide assistance and funding and new risk drivers for public and private property owners emerge

**M**itigating risks and managing potential hazards are some of the most important functions of local governments and public infrastructure and resource managers. Climate change is already starting to amplify the weather-related risks and hazards they and their communities face, and the projected impacts over the coming decades are truly ominous.

But it’s inherently difficult for elected and appointed officials to invest now to prepare for risks that are uncertain and years or decades away. Without an obvious benefit, most of their constituents would rather not pay more taxes or higher rates for big upgrades to their infrastructure or public amenities. And lacking federal money for infrastructure, local governments are already hard pressed to keep up with existing needs.

“A reality for most elected officials is that we live in a world that is highly reactive and not highly strategic,” said Linda Langston, a county supervisor of Linn County, Iowa, and chair of the **National Association of Counties’ Resilient Counties Initiative**. “Getting local elected officials to look at climate change in a more strategic format is hard to do, but it’s required.”

Local governments—often with help from consulting firms and NGOs—are finding ways to fund adaptation planning

## U.S. Local Government Market for Climate Resilience Consulting

While most projects are still small, the local government market for climate resilience and adaptation services is evolving rapidly. Larger consulting projects can exceed \$500,000, and hundreds of millions are going to flood protection projects in vulnerable regions, especially New York. Active firms typically report five to 10 FTEs engaged in U.S. climate resilience work. Changing analyses of flood risks and risk-based valuations of coastal property are expected to drive new investment.

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and measures. Changing federal and state policies and incentives are in some cases pushing local governments to incorporate climate impacts like sea level rise in planning, while new opportunities to price climate risk into private property valuation may be emerging.

In many cases, “climate change” is not highlighted in RFPs or new program announcements. Instead, the broader concept of resilience—one more readily grasped by climate science skeptics—is being embraced by funders ranging from **FEMA** and **HUD** to the **Rockefeller, Barr** and **Kresge** foundations.

While the dictionary definition means “the capacity to recover quickly from difficulties,” most of the new investment

in resilience is in planning, design and engineering that will allow communities to withstand and continue functioning during flooding, droughts and other extreme weather events.

“If you want to maintain a shoreline neighborhood that’s already flood prone and increasingly at risk from sea level rise, you can become more resilient through measures such as elevating homes, improving drainage and even elevating critical access roads,” said David Murphy, coastal resilience lead for consulting engineering firm **Milone & MacBroom**, which has performed coastal resilience studies for several New England communities.

A coastal risk resilience study for a

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small town is a small project, with fees ranging from \$25,000 to \$50,000, according to Murphy and others working in this niche. But the projects identified in such studies can be major—and the studies themselves give a community a leg up in getting FEMA, HUD or other grants for resilience projects. “If there’s a budget in the planning phase [of a resilience study], we can do some concept-level design, and we can help the towns apply for grants,” said Murphy. “We’ve helped some of our clients apply for FEMA grants or HUD CDBG grants for resilience projects, and some have been successful.”

Consulting engineering firm **Kleinfelder** has helped client communities in Massachusetts work through the state’s Coastal Zone Management funding program, which offers “grants ranging from \$50,000 to \$70,000 for cities and

town to do vulnerability and risk assessments followed by adaptation strategies,” said Indrani Ghosh, head of Kleinfelder’s climate change group.

State funding for resilience and adaptation remains sparse, yet opportunities like Massachusetts’ CZM grants can be found. In California, the state’s fourth climate assessment included a \$4.5 million RFP for contractors to help build the capacity of local governments to plan for climate change impacts.

Consultants often volunteer a portion of their time to help with their government clients’ grant applications. Ghosh told CCBJ that her firm has received fees and donated time to help clients respond to resilience grant RFPs—and they’ve assisted in writing their clients’ own RFPs for professional services to implement

**Preparing Communities for a Changing Climate**

<b>CLIMATE RESILIENCE</b>	The ability to prepare for and adapt to changing conditions; and to withstand, respond to, and recover rapidly from disruptions
<b>HAZARD MITIGATION</b>	Taking action before the next disaster to reduce human and financial consequences later
<b>CLIMATE ADAPTATION</b>	Adjusting natural or human systems in a changing environment that reduces negative effects and takes advantage of opportunities

**BY THE NUMBERS**

<b>70%</b>	Increase in rainfall during heaviest storm events in the Northeastern U.S. region (1958-2010)
<b>37%</b>	Reduction in average stream flows in major Southwestern rivers and basins since 2001
<b>\$1</b>	Spent on mitigation saves an average of \$4 in recovery costs following a natural disaster
<b>\$43 BILLION</b>	In CDBG-Disaster Recovery funds administered by HUD to states and localities to assist with recovery between 2005-2013

Source: HUD Office of Economic Resilience

grant-funded projects. “Of course, these have to go through a public bidding process, but we have the advantage of being more familiar with what the RFP entails since we helped craft it,” said Ghosh.

This pro bono trend is reflected on a larger scale by the substantial donations of services that firms such as **Arcadis**, **AECOM**, **Arup** and **CH2M** are making to the **C40** and **Rockefeller 100 Resilient Cities** initiatives. Arup’s donation of services to C40 over the last three years comes to about \$1 million, for example. (See firm profile in this issue).

On the other side of the same coin, NGOs like **The Nature Conservancy** and **Georgetown Climate Center** and private foundations such as **Kresge**, **Rockefeller** and **Barr**, are stepping up with funding, technical assistance and help with initial planning that can position local governments to obtain state and federal funds. See **NGOs Leverage Expertise, Funding** story in this issue.

## Federal carrots and sticks

Beyond the realm of government spending, consultants and NGOs are helping local officials understand and communicate the financial case for investment in resilience by pointing to the benefits of discounted residential flood insurance premiums that can be secured when communities achieve higher ratings under FEMA’s **Community Rating System (CRS)**. “All communities that participate in the **National Flood Insurance Program** are eligible,” said **Andrew Hadsell**, unit manager for the **Amec Foster Wheeler** office in **Raleigh, North Carolina**.

Communities enter the CRS system at a 10, and when they take actions prescribed by FEMA, they can achieve lower ratings—with each step cutting NFIP premiums for property owners in flood zones by 5%. “The community makes commitments to hazard mitigation and resilience through participating in these activities, and private property owners car-

## Adaptation is Evolving

Most state and local governments are at the early phases of adapting. The dominant focus has been on “soft” activities like planning, vulnerability assessments, and capacity building. While planning is occurring at all levels of government and plans are becoming more sophisticated in their analysis of potential impacts and consideration of policy responses, planning is occurring in an ad hoc manner.

This is primarily because there are few incentives, mandates or dedicated sources of funding for adaptation. As a result, adaptation planning is taking many makeshift forms that reflect different local champions (for example, senior policymakers, agency staff, or community activists), threats (such as sea-level rise and urban heat-island effect), and vulnerable sectors (such as transportation and ecosystems).

New incentives and mandates include: President Obama’s January 2015 Executive Order making federal flood risk management policies more robust (which resulted in FEMA requiring climate to be considered in state hazard mitigation plans) and HUD’s \$1 billion **National Disaster Resilience Competition**.

As the level of scientific understanding and technical capacity increases, more and more jurisdictions are planning to meet unique local needs. Fifteen states have completed comprehensive, state-led adaptation plans (AK, CA, CO, CT, DE, FL, ME, MD, MA, NH, NY, OR, PA, VA, and WA); an additional seven states (HI, MI, MN, NJ, RI, VT, WI) are undertaking some form of adaptation planning that is either in progress, academically driven, or sector-specific; and roughly 50 local jurisdictions have adaptation plans that take a variety of forms.

Few states and communities are implementing their plans by making “hard” changes in law or policy that alter regulatory and management decisions in light of projected climate change.

*Source: Adapted and updated from Lessons from the Front Lines; a Synthesis Report to the Kresge Foundation, Georgetown Climate Center, July 2014*

rying flood insurance get that reduction in premiums,” said Hadsell.

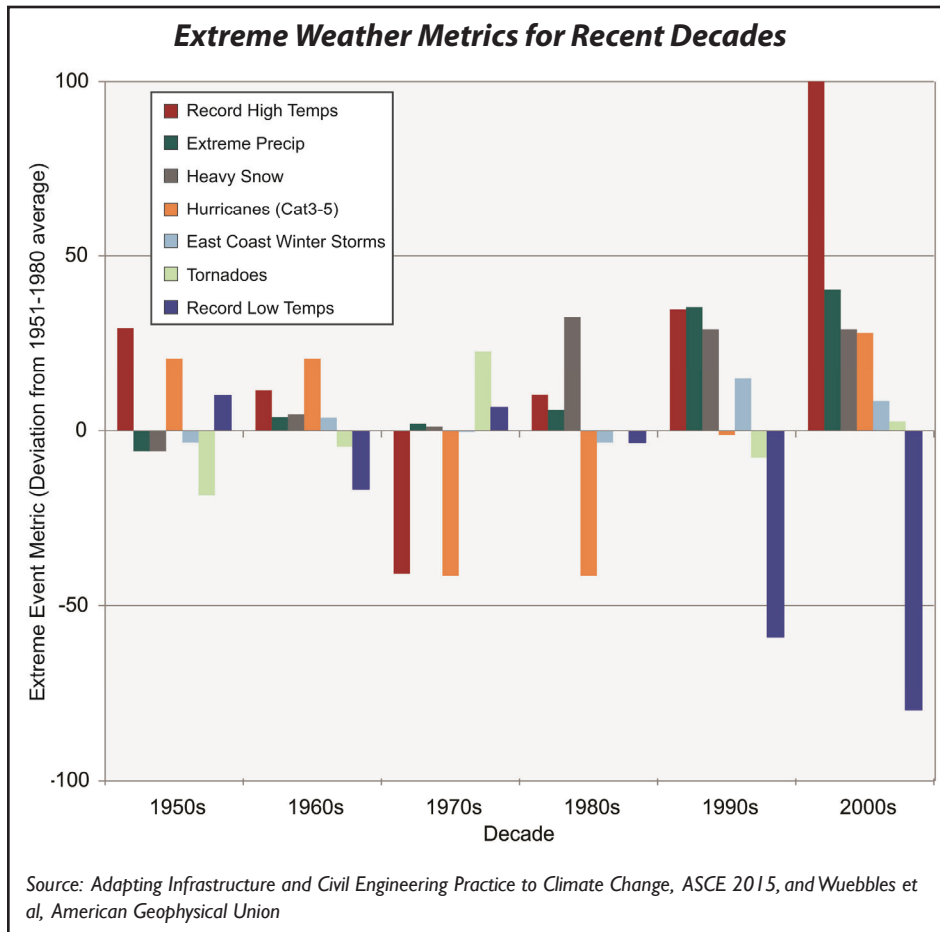
**Amec Foster Wheeler** assisted **Charleston, South Carolina**, in lowering its CRS rating from a 7 to a 6, according to Hadsell, and this saves city residents \$1.2 million annually on their flood insurance policies. “If Charleston can go from a 6 to a 5 [NFIP policyholders will] save another \$1.2 million.”

“We have this discussion [about CRS ratings] with every local government we work with. If we can help a local government recognize the benefits of investing in the CRS program, we can help them develop a path forward,” Hadsell continued, adding that achieving ratings of 7 or 8 can be done relatively easily. “When you start trying to achieve a 5 through 1,

the investments become big ticket items, such as updating watershed management plans.”

While CRS can be considered a federal “carrot” for local governments to invest in resilience and adaptation, “FEMA’s interest in local governments putting consideration into identifying and planning mitigation for possible climate change impacts, such as sea level rise—and having this information considered in hazard mitigation plans—may be considered a stick,” said Hadsell.

“Hazard mitigation plans are now required to include a section that addresses climate change adaptation,” he said. “For a lot of communities, there’s nothing of concern. But when you start talking about coastal communities and communities



subject to drought, the FEMA requirement promotes understanding of the need for increased resilience over time.”

Amec Foster Wheeler’s client Charleston was badly flooded in October 2015 with a “days-long onslaught of tidal flooding, high surf and beach erosion,” as described by Weather.com. Before the flood waters had receded, FEMA was opening disaster assistance centers and urging eligible individuals and business owners to apply for federal assistance. “Fortunately, Charleston is very good about maintaining their hazard mitigation plans. If they had not maintained it on that five-year cycle, when the federal disaster designation went into place, that community would have been told it wasn’t eligible [for mitigation funds],” said Hadsell. (An up-to-date plan is not needed to be eligible for assistance funds after a disaster.)

FEMA’s requirements for state hazard mitigation plans are becoming more robust, according to Erika Spanger-

Siegfried, senior analyst in the **Union of Concerned Scientists’** Climate and Energy program. “When it comes time for a state to submit its updated plan, it will now need to factor in climate change. We also expect FEMA’s technical mapping advisory council to come out with new recommendations to account for sea level rise in future updates to its maps,” said Spanger-Siegfried. “These changes will better represent the world we live in.

“The question of how to make flood insurance affordable for people is a vital one we need to tackle as rates come in line with risk,” added Spanger-Siegfried. “We need to stop making decisions upon which people’s safety, homes, and future depend that aren’t reality-based. But we need to make sure people can cope with the costs.” While proposals exist to manage costs, even the recent updates to FEMA flood maps can push flood insurance premiums up, heightening local government leaders’ incentive to improve their CRS ratings, according to Spanger-

Siegfried.

## Sea level rise risk to affect property values?

In addition to the opportunity to reduce residential flood insurance premiums—or mitigate future increases in premiums—a potential new driver to investing in resilience may lie in risk assessments and disclosures for individual properties. On the large commercial development scale, insurance companies and assurance firms such as PWC are working with the UN and NGOs to advocate that lenders require large commercial borrowers in vulnerable coastal cities to conduct 1-in-100 stress tests to determine how their properties will fare in storms made worse by climate change and sea level rise. (More on that in the insurance feature on CCBJ’s website: [tinyurl.com/ccbjpage](http://tinyurl.com/ccbjpage)).

In highly vulnerable Florida, environmental attorney and law professor Albert J. Slap and a team of climate scientists including Keren Bolter have teamed up to create Coastal Risk Rapid Assessment, an flood risk assessment tool for coastal properties. “Right now, when you look at property values, the closer a property is to the coastline, the more value is added to the property,” said Bolter.

With sea level rise, many coastal properties will be physically vulnerable to flooding—and susceptible to increasing flood insurance rates of the nature mentioned by UCS’s Spanger-Siegfried. “This is a real risk that people don’t think about,” said Bolter. “Ultimately, this should be a disclosure requirement, like a termite inspection.”

“We created this tool because the existing datasets in the public domain are hard to use and interpret,” said Bolter. “Our goal is democratize this data by taking government datasets at the highest level of accuracy available and putting that data through our algorithm in a way that makes it usable for a property owner or buyer in any coastal county in the



country.”

The CRRA works by taking a range of sea level rise projections and evaluating how much more often a property will be flooded in the future. Properties are scored by the estimated number of flood days during a 30-year mortgage period, with the progression broken into five-year increments. A sample CRRA score shared with CCBJ shows a property on Key Biscayne going from zero flood days in 2020 to between 11 and 20 by 2035.

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*“While the climate-informed science approach is more mature in coastal areas and perhaps not yet viable in riverine areas, it is almost universally recognized that climate change is happening and that it will lead to significant changes in flood risk.” - Association of State Floodplain Managers*

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Coastal Risk Consulting takes on a wide range of projects for local governments, including peer reviews of stormwater management plans developed by engineering companies. But Bolter foresees use of the CRRA becoming widespread in coastal communities. The firm has automated the CRRA for most of South Florida and anticipates automating it for the entire U.S. by 2017.

Bolter points to Hurricane Sandy as the top illustration of why changing flood risks for coastal properties should become part of real estate transactions. “I’ve looked at Zillow for the price history of some coastal properties in New Jersey. It’s not uncommon to see a property that was valued at \$500,000 before Sandy now selling for \$150,000.”

From the perspective of local govern-

ment leaders, quantifying the threats to coastal real estate—and seeing those threats reflected in diminished property values—could create more of the urgency they need to prioritize investing in resilience.

“I think the private market is going to be the most forceful in vulnerable coastal communities with a lot of high value real estate,” said Jessica Grannis, adaptation program manager for the Georgetown Climate Center. “Politicians all have very short time horizons. They’re not looking ahead 50 or 100 years to evaluate how climate change will affect these structures near the shorelines.”

### **Flooding big driver for resilience in Midwest**

While coastal cities worry about flooding from rising seas, many Midwestern cities are concerned about record-setting floods from creeks and rivers—and increasingly, from urban runoff made more severe by the higher rainfall amounts.

NACO’s Linda Langston said the June 2008 floods in Cedar Rapids, Iowa, galvanized local governments there to improve their resilience to flooding. “Flood stage on the Cedar River is about 12 feet, and previous floods over the last 150 years had gone to 21 or 22 feet four times,” said Langston. “In this case, the flood went to 31 feet, and the velocity was much faster and more damaging than anything we’d experienced before.”

Langston says that climate change denial is slowly eroding away in Iowa—where corn and other commodity crop farmers are highly dependent on summer rains. “Farmers who have been farming for generations are pragmatic people,” she said. “They may not talk about ‘climate change,’ but they will freely admit that the weather has been weird.”

“While this summer [of 2015] saw intermittent rain, for the previous three years we had a lot of rain in spring and

### **ASFPM on Executive Order 11988, 2015 Federal Flood Risk Management Standard**

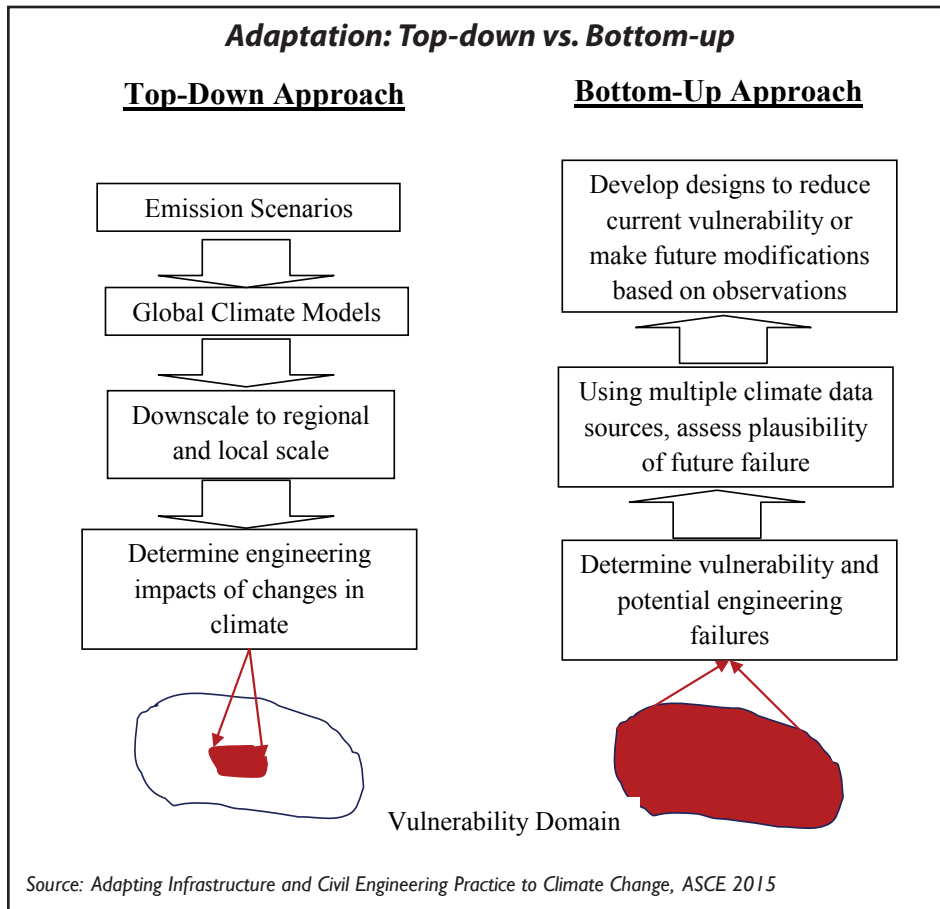
The standard this nation has used for the last 38 years (build to the base flood elevation) is simply not working to reduce flood losses. Annual flood losses have increased from \$5.6 billion per year in the 1990s to well over \$10 billion in the 2000s. Furthermore, flood losses don’t end at the boundary of the 100-year floodplain, as 25 percent of the dollar losses in the National Flood Insurance Program occur outside of the 100-year floodplain.

These numbers show that the nation can no longer afford to design to the old standard. The freeboard and 500-year approaches are pragmatic and widely implemented by states and communities already. In fact, more than 62 percent of the U.S. population lives in a community with at least 1 foot of freeboard that applies to all development activities, not just federal actions.

And while the climate-informed science approach is more mature in coastal areas and perhaps not yet viable in riverine areas, it is almost universally recognized that climate change is happening and that it will lead to significant changes in flood risk.

This standard does not attempt to address the causes of those changes, but appropriately focuses on how federal dollars should be spent in order to protect the taxpayer’s investment. Finally, ASFPM appreciates the flexibility in the standard, enabling agencies to determine the most appropriate approach for a given federal action. While we do have detailed suggestions and comments for improving the FFRMS, ASFPM nonetheless is fully supportive of the standard.

*Source: Excerpted from April 2015 Comments from Association of State Floodplain Managers*



into early summer to about the Fourth of July, then no rain for eight weeks. That had a lot of impact on commodity crops.”

Ceil Strauss, Minnesota state floodplain manager, described an increase in “higher intensity events” over the last 10 years. “We have been seeing more floods from storms that are in the 10, 12 and 14 inch range,” said Strauss. “We’ve always had those in the past, but maybe every 10 years. We’ve had quite a few in the last decade.”

To provide new revenues for flood control and stormwater management, hundreds of U.S. communities have created stormwater utilities that charge property owners fees based on their estimated runoff to the sewer systems. The increases and change in precipitation patterns in the Midwest may lead more such communities to take this route, and this is discussed in the Squash the Hydrograph story on natural stormwater management in this issue.

### Wet-Dry cycles bring WQ issues

Water utilities and stormwater managers in Midwestern states and cities are also “looking very hard at how changing weather patterns could affect their water quality,” said Tony Mardam, **Stanley Consultants’** practice leader for water. (See profile of Stanley Consultants.) “Some of our cities now are seeing patterns of one dry year followed by one wet year,” said Mardam. In agricultural states like Iowa, this means that during the wet year, “a lot more fertilizer will run off into creeks and rivers than you expect.”

“Some Midwestern clients are seeing water quality deteriorate because of more frequent and pronounced swings between wet and dry years,” said Mardam. “The stochastic models prepared by hydraulic researchers clearly show this is happening, and we’re seeing it as engineers when we sample the water sources. Fertilizer runoff is becoming a growing problem in quite a few watersheds due to this developing bi-annual pattern of wet years following

dry years.”

### Illinois “surprise”

A recent study of flooding in Illinois surprised the state’s floodplain manager. “The face of flooding in Illinois has changed,” said Paul Osman, manager of Statewide Floodplain Programs for the state Office of Water Resources. “We have done a very good job mitigating flood losses in mapped floodplains. Those losses are declining. However, flood losses outside of the floodplain are on the increase primarily in urban areas [and] caused by short-term and localized extreme rainfall events which exceed storm sewer design capacities. [These] now account for 90 percent of damages.”

Climate change is pegged as a factor in this trend in Illinois flooding, according to a summary of the report by Illinois Public Radio. “Average temperatures in Illinois have warmed by about 1 degree over the last century. And warmer air can hold more water vapor,” states the IPR summary.

“That could explain why precipitation in Illinois has increased 10 percent over the past 100 years — from an average of 36 inches a year to 40. Over the past decade, Illinois cities experienced an average of 1.8 storms with 4 or more inches of rain — the highest that rate has ever been.”

Not coincidentally, it was in Illinois where **Farmers Insurance** affiliates sued local governments for failing to plan for climate change—and thereby exposing Farmers’ insureds to damages. “We are very aware of the Farmers Lawsuit,” said Osman, who defended the affected communities as “doing exemplary work [with] very proactive floodplain and stormwater programs.”

### Midwest floodplain managers: we need better data on climate change

What they’re lacking is “the data to

support long-term and proactive planning,” said Osman. In Illinois and the Midwest generally, Osman says “we are struggling to find quantitative data to plan for climate change. If the data were there, I have absolutely no doubt our communities would adopt those strategies. As you know, Farmers withdrew the lawsuit. I suspect they realized the same truth. The lawsuit has had no impact on voters or public officials as far as I know.”

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*Local governments—often with help from consulting firms and NGOs—are finding ways to fund adaptation planning and measures.*

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While good localized data on climate change impacts in the Midwest may be lacking, planning for flood resilience is still increasing. Louise Yeung, an urban planner for the **Chicago Metropolitan Agency for Planning**, told CCBJ that “there’s a great deal of assessment work around urban flooding” due to basement and sewer back-ups rather than riverine flooding within a floodplain.

Another recent study enabled by the Urban Flooding Awareness Act passed by the Illinois General Assembly found that urban flooding has cost Illinois communities over \$2.3 billion of documented damages from 2007-2014 and is expected to be exacerbated further by climate change, according to Yeung.

Many Illinois communities are taking proactive approaches to building climate change resilience, according to Yeung. “The City of Chicago is doing a tremendous amount of work around climate resilience and was recently named one of the Rockefeller 100 Resilient Cities,” said Yeung. “They have been focusing on connecting climate action to green infrastructure and workforce development as well.”

And four jurisdictions in Illinois—

Chicago, Cook County, DuPage County and the state—made it into the final round of HUD’s National Disaster Resilience Competition, according to Yeung. Awards from the \$1 billion fund were scheduled to be announced in December 2015. Nationwide, 40 communities made it through the first screening, according to the NDRC website.

### **More than just engineering**

As communities look to improve their resilience to flooding, sea level rise and other climate change impacts, leaders—and the consulting firms that want to work for them—must focus not just on upgrading infrastructure but also on planning for—and urging residents and businesses to plan for—the next disaster, whether it’s climate-related or not.

“If you’re a business consultant in this arena and you’re talking about climate change, I think one of the best offers you could make is to help businesses and local governments with their contingency plans,” said Langston. “Your business would become the friend of every state hazard mitigation officer and emergency planner. And building these kinds of relationships is also going to do your firm good.”

In late October 2015, Hurricane Patricia plowed through the western Mexico state of Jalisco—but with very few casualties because Mexican authorities had learned lessons “from botched or inadequate responses to earlier catastrophes,” according to a New York Times story quoting Richard Olson, director of the **Extreme Events Institute at Florida International University**. “It looks like they got this one right.”

“Mexico now has a national emergency response system that reaches from the central government to the local level. ‘There was a strong learning curve and they put resources into it,’ Mr. Olson said.” Effective measures included warning local residents on radio, TV and social

media and evacuating people well ahead of the storm.

Amec Foster Wheeler’s Andrew Hadsell points to the need to convey the message “Turn around, don’t drown” to drivers in flooded regions. “This is one of the biggest issues with flood risk,” he said. “It is so challenging to convey this message to the general public.”

“I was frustrated during recent storms because a network television channel in the Norfolk area was showing video of people water skiing behind cars through flooded waters, and we constantly see cars driving through water as it rapidly rises in roadway-overtopping scenarios,” said Hadsell. “This is an excellent example of an opportunity for local governments to promote risk communication and increase awareness of the variety of potential impacts from flood hazards.”

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*Leaders—and the consulting firms that want to work for them—must focus not just on upgrading infrastructure but also on planning for the next disaster.*

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From better communications around how to drive in a flood to massive infrastructure projects like those described in the living shorelines story in this issue, extreme weather and climate change seem to be presenting a growing number of new opportunities for businesses to provide solutions to local governments. ☼