Facing Climate Change, Cities Embrace Resiliency

BY: Daniel C. Vock | September 2014

The flash floods that have long plagued Dubuque, Iowa, seem to be getting worse. Although the city lies on the Mississippi River, the biggest threat of a deluge is from the sky. Summer storms are being stoked by increasingly warmer air. As a result, they carry more moisture and soak the low-lying areas and hills that ring the city. The water speeds downhill toward the Bee Branch Creek, a partially buried waterway that flows beneath several neighborhoods before emptying into the Mississippi. Often, the storms dump so much rain that the creek’s concrete channels cannot contain the runoff. Water spills over streets, across backyards and into basements. It can push open manhole covers, spray out from fire hydrants and carry away parked cars.

As is happening elsewhere in the Midwest, the storms are coming through Dubuque with greater frequency and ferocity than in the past. Six times since 1999, Dubuque has been declared a presidential disaster area. One storm in 2011 dumped nearly 11 inches of rain on the city in less than 24 hours. That July set the record for the rainiest single month in Dubuque history. The city estimates that, since 1999, floods in the Bee Branch Creek watershed have caused $70 million in damage to homes and businesses.

When storm sirens sound, the neighborhood’s residents -- many of them elderly people or families with small children -- have few safe options, says Mayor Roy Buol. “You’ve got a heck of a choice,” he says. “You can go into your basement that’s flooding with water and risk electrocution. Or you can stay upstairs and risk the effects of a tornado or straight-line winds that can do damage to your home or rip it off its foundation.”

The mayor worries that climate change, which has raised the average U.S. temperature by 1.5 degrees since 1895, will only make the storms worse. So Buol and other Dubuque leaders are planning for major infrastructure improvements to give the city resilience in the face of global warming and natural disasters.

It is a role more and more local government leaders are assuming. “Cities,” wrote the authors of this year’s National Climate Assessment, “have become early responders to climate change challenges and opportunities.” Like first responders, localities do not have the wherewithal to take on the entire problem of global warming themselves. But they have tools to improve the situation until greater resources can be brought to bear.

In Dubuque’s case, the city is moving ahead with a plan to end the chronic floods. The plan involves opening up the Bee Branch Creek to daylight. The newly visible channel would be the centerpiece of a linear park, stretching nearly a mile between the city’s North End neighborhood and the Mississippi River bank. The park will serve a practical purpose: It will shape the contours of the creek to slow the water’s flow, trap pollutants and sediments, and provide a protected space for overflow after heavy rains.

Along with those improvements, Dubuque will also expand other stormwater pipes in the area. Five years ago, the city began replacing the first of 240 alleys in the watershed with “green alleys” that absorb rain into the ground rather than directing it to the stormwater system.

The cost for all of those upgrades will exceed $200 million. That is a hefty sum for the city. Its most expensive capital project to date, a wastewater treatment plant that opened last year, cost $68 million. But Dubuque officials say the watershed improvements will prevent more than $580 million in damage over the next century. The city will finance the Bee Branch Creek upgrades with a combination of state flood-control money, federal grants, local bonds and stormwater sewer fees paid by city residents.

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Early signs of climate change -- the supercharged storms in the Midwest, droughts and forest fires in the West, and sea level rise on the coasts -- are forcing cities like Dubuque to prepare for a future in which new weather patterns can overwhelm existing infrastructure.

Already, local officials around the country are getting a glimpse of that future. They saw it when a storm that meteorologists called a “wall of water” -- eight inches of rain fell in the first 24 hours -- came seemingly from nowhere and fell on the city of Boulder and other drought-stricken stretches of Colorado last year. They have seen a snowstorm cripple traffic in Atlanta, floods come to Miami Beach’s streets without a cloud in the sky and a “superstorm” turn the New York skyline dark for days.
All those incidents drew considerable attention. But Superstorm Sandy, the combination hurricane and nor’easter that crippled the New York metropolitan area almost two years ago, was a wake-up call for local officials in every region.

Superstorm Sandy killed more than 130 people. It damaged or destroyed 650,000 homes and left 8.5 million customers without power, some for weeks. Sandy flooded New York subway tunnels, broke natural gas lines and caused shortages of gasoline and diesel, even for emergency personnel. It was the third most expensive natural disaster in the nation’s history, trailing only Hurricane Katrina and the 1988 drought.

The response to Superstorm Sandy was also remarkable. Rather than simply rebuilding what had been destroyed, government officials at the federal, state and local levels began thinking about changes that might prevent a repetition of the widespread devastation Sandy had caused.

That approach popularized the idea of “resilience” or “resiliency” in communities. In its broadest sense, resilience can incorporate preparations for -- and rapid recovery from -- any type of disruption, whether it is a terrorist attack or an economic collapse. The Rockefeller Foundation’s 100 Resilient Cities initiative characterizes resilient cities as those that learn constantly, rebound quickly, fail gracefully, operate flexibly and ensure spare capacity of vital resources.

But a panel from four federal research academies, writing just months before Sandy made landfall, tied the concept of resilience more directly to disaster preparedness. “A culture of resilience provides a way to reduce vulnerability to disasters and their impacts before they occur, with the potential to decrease disasters’ costs and consequences,” the researchers wrote.

The newfound enthusiasm for resilience at the local level is as much about addressing longstanding problems as anticipating new ones. Flooding in the Bee Branch Creek watershed, for example, has confounded Dubuque for more than a century. What is different now is the urgency leaders feel in addressing it.

_Tropical Storm Ida flooded Norfolk, Va., streets in 2009. (The Associated Press)_

**It’s a similar situation** in Norfolk, Va., where flooding has been a familiar occurrence since English settlers first arrived in the early 1600s. That’s because the low-lying land, laced with rivers and inlets, is slowly sinking. Drivers are used to taking alternative routes when they hear a road is flooded. “We’re not unlike any other old seaport city. We’ve dealt with storms for centuries. It’s a nuisance,” says Ron Williams, a deputy city manager.

But in the first decade of the 2000s, Norfolk experienced more coastal storms than it had in the previous four decades. Measured by wind speed, storm surge and the amount of rainfall, the decade’s storms ranked among the most severe in the past 50 years. A 2009 nor’easter, for example, brought 7.4 inches of rain and raised tides more than 5 feet above normal high-tide levels. So the city started developing a plan to cope with the more intense storms and sea level rise.

At the same time, those disasters helped Norfolk add resilience to the city’s normal operations. When work was done on an intersection near a medical center, for instance, engineers also elevated a road to block floodwaters that had long washed over the route to the hospital. Norfolk has been able to tap federal funds to raise homes threatened by flooding and to create more environmentally friendly shoreline. Those efforts attracted the attention of the Rockefeller Foundation, which designated Norfolk one of its 100 Resilient Cities. That means the city was able to hire a chief resilience officer and work with outside experts to handle its preparedness efforts.

But those steps do not address Norfolk’s most pressing need. New floodwalls and gates are required in four different neighborhoods. That is an expensive proposition for any city, much less one where the poverty rate is double the statewide average. City officials are hoping for help from the state or federal government, noting that the city is home to one of the few deep water ports on the East Coast and the largest naval base in the world. “Everything that Norfolk needs to do is $1 billion,” says city spokeswoman Lori Crouch. “We don’t have $1 billion.”
The intense storms that worry Norfolk leaders are troubling for many city officials, not just those on the coasts. The number of presidential disaster declarations has surged in recent years—reaching an all-time high in 2011. Even accounting for inflation, six of the 10 most expensive storms in the U.S. occurred in the last decade.

But if there is a silver lining to the destruction, it is that rebuilding after one disaster offers a unique opportunity to prepare for the next, as the state of New York has tried to do after Superstorm Sandy.

"The new reality in New York is we are getting hit by 100-year storms every couple of years," said Gov. Andrew Cuomo in January, as he announced plans for spending federal recovery money. "We have to wake up to that new reality by completely reimagining our state to be ready for any future disaster."

Cuomo hopes to speed that process along with $17 billion -- mostly in federal disaster relief funds -- to upgrade the state's infrastructure. The biggest part of the package is $5.1 billion for New York City's subway system, which shut down completely for three days during Sandy. The money would pay for improvements to make it easier to seal off tunnels and underground facilities in case of flooding. The governor also plans to use federal money to help build levees and seawalls to protect wastewater treatment facilities. The proposal calls for burying 500 miles of overhead power lines and other measures to "harden" the electric grid, along with creating 10 microgrids that could keep power flowing in case of a larger grid failure. The list goes on: a statewide fuel depot for emergency responders, wetlands creation and restoration, bridge replacements, and money for municipalities to do their own resiliency planning.

At the local level, says Niek Veraart, of the infrastructure consulting company Louis Berger, communities should have projects ready that they want to build when funding becomes available. The communities in New York that had projects ready to go were in a better position to secure federal funding after Sandy struck. "Every time there is a disaster, you use the money you get from the disaster to build up your long-term resiliency," he says.

Indeed, that is part of the reason Dubuque will be able to move forward with its flood mitigation plan. The city had already begun efforts to improve the Bee Branch Creek when the legislature passed a flood relief law in 2012 to address the widespread flooding that had inundated Iowa cities for several years. Nearly half of the money Dubuque will use for the Bee Branch Creek project will come from the state, significantly speeding up the schedule for construction.

Of course, cities would much rather put resilience measures in place before the next disaster strikes than afterward. But with limited outside help, they still must rely on local funding sources to meet the most immediate needs.

**Miami Beach, Fla.'s stormwater drainage system has been strained by rising sea levels.**

*(Meunierd/Shutterstock)*

The city of Miami Beach, Fla., plans to spend $300 million in the next five years to install more than 50 new pumping stations for its stormwater system. The city currently uses a gravity-based system, in which pipes carry runoff down to Biscayne Bay. But with climbing sea levels, salt water seeps into the pipes at high tide and spills out into city streets, even when it isn't raining. The new pumps, plus one-way valves in the pipes, would keep the seawater from entering.

The first $100 million of that project would be paid by residents in their stormwater utility bills. Miami Beach officials are considering tax increment financing, resort taxes and loans from the state for the second $100 million. The city is hoping that by the time it needs to pay the final $100 million for the project, either the state or federal government will offer grants allowing it to complete the job.

The to-do list for Miami Beach in coping with rising sea levels is extensive. The city is trying to move back to a more natural shoreline, because developers and residents have filled in areas of the barrier island that were once mangrove swamp. Reintroducing more natural elements would benefit wildlife, such as sponges, coral and migratory birds, while also absorbing the brunt of ocean waves. The city also wants to raise the minimum height of seawalls since they are increasingly becoming submerged at high tide. Another major concern is salt water intrusion into the drinking water supply. As sea levels rise, ocean water can get into the porous rock beneath the city and contaminate its water wells.

http://www.governing.com/templates/gov_print_article?id=272900161
City Public Works Director Eric Carpenter recognizes the difficulties Miami Beach faces, but he also touts the city's assets. "We have approximately $22 billion worth of property value in the seven square miles that make up Miami Beach," he says. "So when you're looking at it from a perspective of having $22 billion in assets, coming up with half a billion dollars to become resilient becomes a little bit more manageable."

South Florida, according to the National Climate Assessment, is one of the regions in the country most vulnerable to climate change. Recognizing that they face common challenges, four counties in the region formed the Southeast Florida Climate Compact five years ago. The counties agreed on a common sea level rise projection for their planning — somewhere between 9 and 24 inches over the next 50 years. The group meets annually and has developed 110 recommendations for the region to mitigate the effects of climate change.

The region is considering building a surface water reservoir that would capture fresh water that is now discharged off the coast, says Jennifer Jurado, Broward County's director of environmental planning and community resilience. By reducing flooding, the reservoir would help the area cope with extreme storms, like the 1,000-year storm that hit Palm Beach County, just to the north of Broward County, with 22 inches of rain in a single day in January. But if the localities agree to build the reservoir, Jurado says, the first phase would cost $150 million. "The costs of these types of projects are well beyond the individual resources of a single community, which is what works to drive regional solutions," she says. "No one could afford to do these projects on their own, and even the communities in collaboration will be looking for financial resources either at the state or federal level."

Jurado points out that coastal communities produce 45 percent of the country's gross domestic product, meaning the fate of most regions and most industries is tied to the well-being of those communities. "As a nation," she says, "we can't afford to just allow individual localities to figure it out."

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