

# 20 Leading Resilient Cities Responding to Climate Change & Extreme Weather

For Earth Day, write about the biggest emerging environmental issue in 2013: The need for more resilient communities that can bounce back from destructive extreme weather fueled by climate change. Tell a positive story of the leading cities and counties that are responding with bold actions.

## What Is a Resilient Community?

- A resilient community is able to bounce back from disruptions—climate, energy, economic—in a sustainable way and maintain a good quality of life for all.

## Why Is Resilience a Key Issue?

- Communities around the country are on the front lines of three related challenges: record-breaking extreme weather fueled by a changing climate; energy security and reliance on costly foreign energy that exposes us to volatile price spikes; and ongoing economic uncertainty that has left millions out of work and communities starved for investment.
- NOAA reported that 2012 was the hottest year on record, when nearly two dozen U.S. cities broke or tied their maximum temperature records.
- NOAA also reported that in 2011-2012, 25 “billion dollar” damage extreme weather events caused up to \$188 billion in damages.

## How Are These 20 Leading Cities & Counties Responding?

- These 20 cities and counties represent some of the national leaders on resilience.
- They are responding to challenges by preparing for climate impacts, scaling renewable energy (to reduce demand on the grid during heat waves and protect themselves from energy price volatility), improving energy efficiency, and creating jobs and strengthening the local economy in the process.
- That’s resilience in action.

Fact sheet developed by ICLEI—Local Governments for Sustainability USA, the leading network of local governments committed to sustainability, with more than 1,000 members worldwide. [www.icleiusa.org](http://www.icleiusa.org).



## 20 Leading Resilient Cities & Counties

- Atlanta, GA
- Broward County, FL
- Cambridge, MA
- Chicago, IL
- Denver, CO
- Dubuque, IA
- El Paso, TX
- Eugene, OR
- Grand Rapids, MI
- Houston, TX
- King County, WA
- Lewes, DE
- Miami Dade County, FL
- Milwaukee, WI
- Minneapolis, MN
- New York, NY
- Norfolk, VA
- Salt Lake City, UT
- San Diego Bay Region, CA
- Tucson, AZ
- Washington, DC

To learn more about resilient cities contact:

Don Knapp  
Communications and Marketing  
Director  
ICLEI USA  
[don.knapp@iclei.org](mailto:don.knapp@iclei.org)  
(510) 206-1011



## Atlanta, GA

### Impacts:

- In recent years the City has experienced notably hotter summers, warmer fall and winter seasons, which have exacerbated the urban heat island effect.

### Actions:

- The City is finalizing a climate action plan, an element of its existing Sustainability Plan, which will include tentative strategies to mitigate urban heat island effect, such as:
- Requiring cool/reflective roof standard for new construction or major renovations of city facilities.
- Possible legislation to standardize the reflectivity of new roofs in Atlanta.
- Possible legislation that would require paved surfaces to be covered with “cool pavement.”
- Increasing tree canopy coverage to plant 10,000 new trees by 2013.
- Reducing heat from motors by expanding the Anti-Idling policy to include all vehicles and motors as well as reducing the time-limit to a national benchmark.
- Improving building performance, thus reducing demand on HVAC motors.

Source: City of Atlanta staff

## Broward County, FL

### Impacts:

- Hurricane Sandy and a high-tide event caused major flooding and damage in Fort Lauderdale. A four-lane coastal highway, A1A, was flooded, covered with sand, and shut down.
- Beach erosion impacts from Hurricanes Isaac and Sandy were worsened by NE winds over Thanksgiving 2012, causing portions of the A1A roadway to collapse into the ocean as the beach eroded from under the coastal route.

### Actions:

- In Fort Lauderdale, a public meeting in December brought together government officials (local, state, federal) along with business owners and residents to discuss short-term and long term strategies for addressing repair of A1A and beach erosion.
- The County is incorporating sea-level rise and

climate projections into its existing Comprehensive Plan and Land Use Plan.

- Broward County is part of the four-county South Florida Regional Climate Compact, which recently finalized a climate action plan with a range of strategies to protect the region from climate impacts, such as relocating water infrastructure further inland.
- Broward County is also a participant in the Earth Hour City Challenge, organized by the World Wildlife Fund to help cities prepare for climate change and scale renewable energy..

Source: Broward County staff

## Cambridge, MA

### Impacts:

- Extreme rainfall events in recent years, including July 2010 when 4 inches of rain fell in one hour, flooding streets and sub-grade residential properties, overwhelming storm drain systems and backing up sewers.

### Actions:

- The City Manager directed municipal agencies to conduct a climate change vulnerability assessment, which was launched in October 2012, and will be completed by the end of 2013, at a cost of \$300,000. The assessment will serve as the foundation for an adaptation/resilience plan to prepare for rising temperatures, more extreme storm events, and storm surge flooding associated with sea level rise.

Source: City of Cambridge

Available for media interviews? Yes

## Chicago, IL

### Impacts:

- The City has experienced more frequent extreme heat and flooding in recent years, which impacts public health and safety, and can overwhelm stormwater infrastructure and cause extensive damage.

### Actions:

- Chicago is a national leader on adaptation through its landmark Chicago Climate Action Plan. The plan set long-term adaptation goals to adapt Chicago to the impacts of climate change.

- Chicago is adapting the built environment, natural environment, and people, and below are only a small sample of the many actions that Chicago is taking:
- Chicago has the greenest street in America, and is working to scale this pilot into citywide construction and design standards.
- Chicago leads the green roof industry's implementation and has had the most square feet installed and number of installations, which cools buildings and slows stormwater runoff.
- The City has set up cooling centers throughout the city to respond to human needs during extreme events.
- City staff engage residents in greening Chicago, through the Sustainable Backyard Program, encouraging the installation of green infrastructure at home.

Source: City of Chicago

### Denver, CO and Colorado Springs, CO

Impacts:

- July 2012 was the hottest July in Denver since weather records began in 1872, according to the National Weather Service. Denver's temperature topped 100 degrees on seven days in July, tying the 2005 record for the most 100 degree-days in July.
- The June–July 2012 Waldo Canyon Fire northwest of Colorado Springs destroyed approximately 346 homes and was the most expensive fire in Colorado State history with insurance claims totaling more than \$352.6 million (Source: Rocky Mountain Insurance Information Association).
- Smoke from the Colorado wildfires also degraded air quality in Colorado Springs, Boulder, and Denver, putting the elderly and those with respiratory problems at risk.

Actions:

- Denver's Department of Environmental Health is coordinating climate change adaptation planning with a working group of city agencies for expected future climate conditions.
- Denver's climate change adaptation working group has developed a vulnerabilities assessment, is summarizing response strategies and will use Denver's Environmental Management System to implement strategies and measure success.

Source: City and County of Denver

### Dubuque, IA

Impacts:

- Severe drought and heat across Iowa have devastated corn and soybean crops, and in Dubuque required cooling centers for the elderly and vulnerable populations.
- In July 2011, a severe flash flood caused between \$8–\$10 million in damage (Source: Project Concern in Dubuque).
- Since 1999, the City has had 7 presidential disaster declarations due to severe flooding.

Actions:

- City is building new \$64 million wastewater treatment facility that has capacity to hold water and prevent sewer overflows during floods.
- Launching a green alley program to put permeable pavers in alleys, alleviate flooding
- Expanding a storm sewer to divert water from a section of the city that flooded frequently and put 1,100 homes and businesses at risk.

Source: Mayor Roy Buol, City of Dubuque

### El Paso, TX

Impacts:

- El Paso averages about 15 days of 100+ degree days, in 2012 there were 28 days over 100 degrees. This kind of heat is tough on everyone and increases the risk of heat related conditions such as heat stroke especially in our elderly.
- Severe drought put drinking water supplies at risk. The Elephant Butte reservoir was reduced to only 5% capacity, a major concern because it supplies water to El Paso and other cities.

Actions:

- The City was already a national leader in water conservation, but a new "Less is the new more" conservation campaign launched this year helped reduce water demand by 635 million gallons compared to the first nine months of 2011.
- In preparation for extreme weather including heat, an Extreme Weather Task Force was established

10 years ago. Its purpose is to bring awareness to the community about staying healthy and hydrated, finding cool zones in the community such as senior centers, libraries, and malls. The Task Force encourages a buddy system to have people check on others during these conditions.

Source: City of El Paso staff

## Eugene, OR

Impacts:

- A major wildfire on the east side of the Cascades (Pole Creek Fire, Oregon) produced smoke that lingered in the Willamette Valley for days—causing respiratory distress, particularly for vulnerable populations: young, old, and asthmatics. These types of events are expected to increase in the future.
- Ultra-dry conditions created forest fire danger into October (second driest summer on record). About 10% of Eugene's population live in heavily forested areas so this becomes a real concern.

Actions:

- The City of Eugene has developed and is implementing a Community Climate and Energy Action Plan that includes actions to adapt to the effects of climate change. Strategies include increasing water conservation; increasing investment in the urban forest; removing essential services from the 100-year flood zone; increasing energy efficiency to reduce demand for hydroelectricity, a resource that is expected to decline with climate change; conducting a food security assessment.
- The cities of Eugene and Springfield are updating their combined Natural Hazards Mitigation Plan to incorporate the changing nature of risks such as flood, wildfire, and heat events.
- The City is conducting a vulnerability assessment that will highlight the actions needed to reduce the risk posed by climate change to community-wide systems such as transportation, drinking water, and electrical systems.
- The City is offering residents climate-adapted tree species for planting along streets in the right-of-way.

Source: City of Eugene staff

## Grand Rapids, MI

Impacts:

- Increasing average temperatures in the Great Lakes region put vulnerable populations at risk and can lead to higher insurance costs, emergency management budgets, and greater property damage leading to clean-up and rebuilding costs, loss of tourism and recreation, and lower rates of businesses locating in the community.
- Hotter summers and more frequent and severe storms are straining energy infrastructure.

Actions:

- The city developed an energy efficiency conservation strategy to reduce demand. Grand Rapids ranks No. 1 in LEED buildings per capita.
- The City has set a goal to get 100% of the City's power from renewable sources by 2020. Diversified energy sources are key for local resilience—including solar, small wind, and geothermal—and key for greenhouse gas reduction.
- To offset the urban heat island effect, the city plans to increase its tree canopy cover to at least 37.5% between 2011 and 2015.
- The City has incorporated climate adaptation strategies and considerations into its Sustainability Plan and its Emergency Action Guidelines.

Source: Haris Alibasic, Director, Office of Energy and Sustainability, City of Grand Rapids

## Houston, TX

Impacts:

- In July 2012, the Houston area experienced a "100-year flood" event after heavy rainfall flooded dozens of homes and streets.
- Heat waves and drought conditions continued in Houston throughout 2012, after a 2011 in which the city broke its own record for number of 100-degree days in a year.

Actions:

- Rebuild Houston is a City program that is meant to reduce street flooding, improve mobility, and reduce structural flooding.
- In July 2012 Mayor Parker formed a Water Conservation Task Force to address water conservation measures and study options on ways to diversify the

city's water supply.

- The City of Houston owns 17 SPACE units (acquired in 2011), which are mobile solar generators made with shipping containers. The generators are designed for emergency relief efforts and were purchased to serve in the recovery efforts for future hurricanes. The units contain refrigerators and air conditioning to provide relief and also to allow emergency equipment to be hooked up when needed.

Source: City of Houston staff

### **King County, WA**

Impacts:

- Since 1990, King County floodplains have been declared federal flood disaster areas 12 times.
- The risk of death and mortality for King County residents is significantly higher on the hottest summertime days; in the region temperatures have increased approximately 1.5 degrees Fahrenheit over the last century.
- Significant damage to private and public property due to flooding, sea level rise and storms has occurred in recent years – and the number of such disasters has increased in the last decade.
- Over the last 100 years sea level has risen an equivalent of 0.68 feet in Seattle.

Actions:

- King County is a longtime national leader on climate action and greenhouse gas management.
- In December the County adopted its 2012 King County Strategic Climate Action Plan to reduce countywide greenhouse-gas emissions by at least 80 percent below 2007 levels by 2050, and to prepare for unavoidable climate impacts.
- In 2011, the County's Flood Control District completed three flood protection infrastructure projects and raised, relocated, or demolished 18 chronically flooded homes.
- King County will integrate observed and projected climate change-related changes in severe weather, flooding, drought, landslides, and related issues into emergency management planning and programs.

Source: King County

### **Lewes, DE**

Impacts:

- Superstorm Sandy caused flooding and beach erosion and knocked out power for 20-25% of the community.
- As a coastal community, Lewes has historically been vulnerable to coastal storms, flooding, and high winds.

Actions:

- In 2011, Lewes developed and approved the first-ever community action plan that combines hazard mitigation and climate adaptation planning processes. Hazard mitigation planning focuses on past events and information to prepare for future hazards, while climate adaptation takes a long-term view of future impacts based on climate change predictions.
- Lewes' planning efforts have resulted in strong communication and collaboration among key municipal stakeholders—police, fire, medical, etc—who work well together during disasters.

Source: Lewes staff

### **Miami Dade County, FL**

Impacts:

- Sea-level rise worsens coastal flooding during storms and high-tide events, damaging property and overwhelming water infrastructure. Sea-level rise also threatens drinking water supplies through saltwater intrusion into drinking water aquifers relied on by millions of residents.
- In 2012, 76 water pump stations serving the County sewer system have exceeded their run times (due to increased precipitation), compared to the annual average of 10-12 stations. This can have serious implications on the pace of development.
- Tropical Storm Isaac in August cost the County \$5.5 million in response and infrastructure damage. Health warnings were issued regarding risk from disease-carrying mosquitoes. An advisory was issued to drain all standing water.
- Superstorm Sandy caused \$2.2 million in damage, half due to beach erosion.
- The city of Miami has been identified as the most vulnerable city in the world in terms of potential property damage due to impacts and rising sea levels.

Actions:

- Stormwater Projects: Approximately \$10 million dollars in capital funding has been budgeted this year for capital drainage improvement and flood mitigation projects.
- Post-Disaster Redevelopment Plan (PDRP): Future sea level rise and the associated increases in flooding are being incorporated into the county's first PDRP. The purpose of the Initiative is to develop a planning process that will encourage vulnerable communities to undertake the preparation needed to ensure long-term sustainability and guide them through pre-disaster planning and post-disaster implementation. The plan is scheduled to be finalized in early 2013.
- Comprehensive Development Master Plan (CDMP): Incorporation of policies addressing sea level rise and climate change into numerous elements of the Comprehensive Development Master Plan is underway.

Source: Miami-Dade County staff

### Milwaukee, WI

Impacts:

- Like much of the Midwest, Milwaukee was impacted by drought in 2012.
- Massive flooding in 2008 and 2010 due to extreme precipitation events wreaked havoc: surface flooding caused major property damage; sewer back-ups from overwhelmed and damaged sanitary sewer laterals led to widespread home contamination; street cave-ins led to very expensive public works projects and property damage.

Actions:

- Recognizing that climate change will bring an increase in major flooding events, the City convened a Flooding Study Task Force to discuss how to prepare for the risks posed by climate change and flooding.
- The City will coordinate with regional planning agencies to monitor climate change trends and incorporate emerging climate models into sewer design criteria and other urban planning efforts.
- The City will evaluate green infrastructure improvements to mitigate flooding impacts, including rain barrels, cisterns, rain gardens, green roofs, storm drain restrictors, porous pavement, median and roadside bio-retention projects, catch basin retrofits, storm water planters, vacant lot bio-retention, increased tree canopy, and downspout disconnection.

Source: City of Milwaukee staff

### Minneapolis, MN

Impacts:

- The January–October period of 2012 ranked as the warmest year on record in the Twin Cities area, with a 4.8 degree departure from “normal.” Minneapolis/St. Paul saw 31 consecutive days of temperatures over 90 degrees in 2012, the most in 24 years.
- 2011–2012 heating season was the warmest on record in the Minneapolis/St Paul region. The Twin Cities average temperatures over that period were equal to living in Omaha, NB.
- Projections indicate that the number of excessive heat events will triple in Minneapolis, with a corresponding mortality rate that will increase by five times the present number.
- Lake Superior saw the highest surface water temperature recorded in a century.
- The Upper Midwest as a whole has seen a 31% increase in very heavy precipitation events between 1958 and 2007 (heaviest 1% of all events). Since 1941, average annual precipitation in the Minneapolis/St Paul region has increased 20 percent.
- 2012 saw devastating floods in Duluth, MN, the worst in the City's history, causing \$50 to \$80 million of damage to public infrastructure alone. Some areas saw as much as 10” of rain in a 24-hour period.

Actions:

- The City of Minneapolis has in place an extensive Extreme Heat preparedness plan to reduce incidences of heat morbidity and mortality and prepare and protect our most vulnerable residents. This plan includes surveillance for indicators of potential impacts, identified cooling and communications strategies for educating and alerting community partners and residents, and resources to prepare individuals for extreme heat events.
- The City is participating in the Minnehaha Creek “Extreme Trends – Stormwater Adaptation Study.” This study is looking at the changing trends in storm events in an urban and suburban watershed, and how well existing stormwater infrastructure can handle these changes. The study will identify ways to adapt stormwater systems to handle changing

precipitation patterns.

- The City is currently updating its Climate Action Plan, which will provide a roadmap to reduce community greenhouse gas emissions 15 percent by 2015 and 30 percent by 2025.
- In 2013 and beyond, in partnership with the University of Minnesota and other partners, the City plans to conduct outreach with residents and businesses about long-term climate impacts and building resiliency.
- The City is an active partner with the Minnesota Department of Health (MDH), which is developing data and mitigation tools on the health impacts of climate change in Minnesota, and tools for local governments to respond to these challenges.
- Minneapolis is an active leader in a state-wide work group with MDH to develop a surveillance tool to assist us with assuring a faster response in extreme heat events to reduce mortality.

Source: City of Minneapolis staff

## New York, NY

Impacts:

- Superstorm Sandy caused \$19 billion in damages and lost revenue in the City, cut power to millions and caused 43 deaths in the City.

Actions:

- The City's landmark sustainability plan, PlaNYC, includes a \$2.4 billion green infrastructure plan that uses natural methods of capturing rainwater before it can flood communities and overwhelm sewage system.
- The City adopted new zoning regulations that eliminate penalties for elevating boilers, generators and other electrical equipment above the ground.
- The City is in the process of restoring 127 acres of wetlands to serve as a natural natural barrier against storms that we have. They have also expanded the Staten Island Blue Belt, which is also a natural drainage system, by 325 acres.
- For major developments in vulnerable areas, the City now requires a climate risk assessment.

Source: Mayor Michael Bloomberg speech, Dec. 6, 2012

## Norfolk, VA

Impacts:

- More frequent coastal storms and high tide events exacerbated by net sea-level rise (14.5 inches over the past century) cause recurrent flooding in the city and naval base. For this reason the U.S. Department of Defense identified the Norfolk Naval Station as one of the top 5 most vulnerable sites in the world to climate change.
- Transportation is crippled when major intersections in Norfolk are flooded regularly.
- Persistent flooding creates a reduction in suitable land for development, and damages public facilities and infrastructure.

Actions:

- The City is implementing a Plan\*Prepare\*Mitigate\*Communicate strategy to actively mitigate flooding in Norfolk and take a proactive approach to expected flooding issues.
- A Flood Executive Committee within the City sets strategic goals on city-wide flooding outreach and has developed partnerships with federal, state, and regional stakeholders.
- Flood proofing or elevating private and public properties, utilities and infrastructure has been done. Norfolk has received \$931,000 from FEMA to elevate five homes in the Colonial Place and Riverview neighborhoods.
- The City of Norfolk's Information Technology department now has STORM (System to Track, Organize, Record, and Map). This is a web-based system used to collect and map incidents during severe weather events. The system was designed to help centralize and standardize data collection required by state and federal agencies during and after a storm, while also providing live mapping updates to the public.
- The city also is integrating "green infrastructure" of trees, rain gardens, wetlands and open spaces to allow water to slow down, soak in, and spread out.

Source: City of Norfolk

## Salt Lake City, UT

Impacts:

- Long-term trends show that as warming occurs, less precipitation is falling as snow in surrounding watersheds, which means a diminished drinking water supply for the City, which gets 90% of its water from surface sources.

- Increases in temperature by 5 degrees Fahrenheit could reduce flows from watersheds 5 to 15% below average flows.
- In recent years, trees in the urban forest are becoming more susceptible to disease due to warming.
- Lower precipitation is causing a dryer forest, increasing the danger of area wildfires.

Actions:

- Long-term master plans for the city will incorporate likely future climate scenarios, including the City's Water Conservation Master Plan.
- Infrastructure Planning: New roads and sewers will be built to handle warmer temperatures and higher runoff volumes.
- Energy Security: to minimize energy demand, especially during heat waves, the City is focusing on energy efficiency upgrades, developing net zero buildings, and expanding local renewable energy sources, such as solar PV and solar hot water systems.
- Efforts to reduce greenhouse gas emissions include energy efficiency projects and transit-oriented development projects to minimize vehicle trips.

Source: Salt Lake City staff

### San Diego Bay Region, CA

Impacts:

- Projected increases in heat waves, wildfires, and drought.
- Coastal flooding and beach erosion due to sea-level rise that threatens coastal property, tourism, and public safety.

Actions:

- The Sea Level Rise Adaptation Strategy for San Diego Bay was published in 2012, one of the nation's first regional approaches to sea-level rise. It included a vulnerability assessment and recommended resilience strategies. The project was part of a multi-year, regional climate partnership between ICLEI, the San Diego Foundation, and all of the region's local governments.
- City of Chula Vista developed a climate adaptation strategy that led to the City revising its grading ordinance to protect coastal redevelopment by elevating building sites.
- City of San Diego is undertaking a project to replenish 1.4 million cubic yards of beach sand, which will result

in \$35 million in recreational and tourism benefits, and \$40 million in prevented storm damages.

Sources: San Diego Foundation, City of Chula Vista, City of San Diego

### Tucson, AZ

Impacts:

- More frequent and severe drought across the Southwest puts water supplies at risk.
- An increasing number of extreme heat events as well as rising average temperatures put vulnerable populations at greater risk of heat-related illnesses and fatalities.

Actions:

- The City has developed a comprehensive water conservation plan. Strategies include encouraging households to install "gray water systems" which collect wastewater from sinks, showers, and washing machines for reuse in irrigating the home's lawns and plants. For businesses, the city provides public recognition to companies that are "water smart," create plans that evaluate water use and establish water budgets.
- The City collaborated with the University of Arizona to complete a climate vulnerability assessment on how climate change will affect the city and its residents. This climate vulnerability assessment will enable the city to better prepare for more severe drought conditions and the increased risk of water scarcity and wildfires.
- The City is revising its Drought Response and Preparedness Plan to explicitly address climate vulnerability to City water supplies.
- The City is a member of the Western Adaptation Alliance, a knowledge-sharing network of western cities that share similar heat and water shortage issues.

Source: World Wildlife Fund website

### Washington, DC

Impacts:

- In July 2012, the District experienced the most extreme heat wave on record.
- Persistent drought continued throughout the year,



with rainfall at 8” below normal.

- On June 29, a powerful “derecho” storm brought winds from 60-80 mph, downed hundreds of trees, and left more than 1 million people without power. (Source: Washington Post)
- The District has experienced severe floods, most recently in 2006, and is at risk for severe storm surge during hurricanes.

Actions:

- A flood gate is being constructed on the National Mall to protect the city core from flooding.
- The District will surpass 1.5 million square feet of green roofs in 2012 as requirements and incentives encourage installation of green roofs, which cool the city and slow stormwater runoff.
- The tree canopy in the District grew by 818 acres between 2006 and 2011, a 2.1% increase which helps provide shade, cool the city, and reduce energy use.
- To reduce GHG emissions and increase energy security, the District is a leader in developing or purchasing renewable energy. The District was recognized in 2011 (and again in 2012) as the #1 US EPA Green Power Community.

Source: District of Columbia staff; *Washington Post*

