

2016 Resilient Cities Summit

Solutions for Sustainable Land Use

DECEMBER 7–9, 2016
SANTA FE, NEW MEXICO





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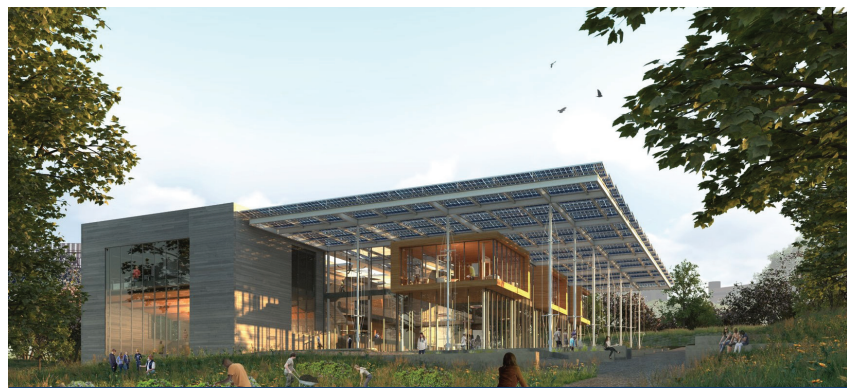


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NLC's Center for City Solutions and Applied Research provides research and analysis on key topics and trends important to cities, creative solutions to improve the quality of life in communities, inspiration and ideas for local officials to use in tackling tough issues and opportunities for city leaders to connect with peers, share experiences and learn about innovative approaches in cities.

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The Urban Land Institute (ULI) is a nonprofit education and research institute supported by its members. Its mission is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. Established in 1936, the Institute has more than 40,000 members worldwide representing all aspects of land use and development disciplines. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice.

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ACKNOWLEDGMENTS

We are grateful for the leadership of our nation's mayors and local government leaders, and for this opportunity to elevate their outstanding work. We would like to extend a special thank you to cochairs **Mayor Javier Gonzales**, **Mayor Mark Stodola**, and **Mayor Dawn Zimmer** and the summit facilitator, **Amy Armstrong**, for their leadership on these issues, and for motivating this group of city leaders, businesses, and nongovernmental organizations (NGOs) from across the United States to convene on this important topic.

We also want to thank our keystone speakers for the event, **Katherine Hammack**, former assistant secretary of the U.S. Army for Installations, Energy, and Environment, and **Danielle Arigoni**, director of the Office of Economic Development at the U.S. Department of Housing and Urban Development (HUD).

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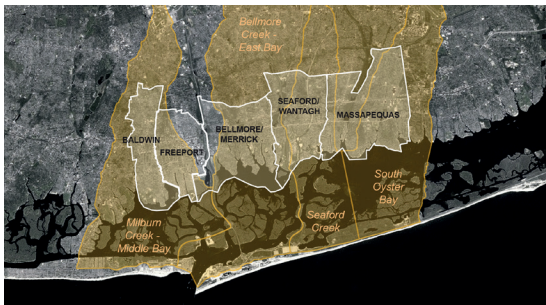


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ARUP

Shaping resilient cities

A global design and consulting leader in the built environment, Arup collaborates with municipalities, developers, architects, and partners like C40 and The Rockefeller Foundation to improve urban sustainability and resilience. Our offices in the Americas region draw upon a 12,000-strong global network of practitioners and thought leaders to help municipalities achieve their goals within existing legislative and planning paradigms — or shape new ones. With a strong understanding of the factors that make cities resilient as well as deep practical experience at all scales of design, we help cities and towns better prepare for the shocks and stresses of a rapidly changing environment.



NY Rising Community Reconstruction Program
New York City and Long Island, NY



Climate Change Vulnerability Assessment
Somerville, MA



Community Coastal Resiliency Plan
Stonington, CT

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SUMMIT OVERVIEW

INTRODUCTION

In December 2016, the National League of Cities (NLC), the U.S. Green Building Council (USGBC), and the Urban Land Institute (ULI) hosted the second Resilient Cities Summit in Santa Fe, New Mexico. The 2016 summit convened mayors, senior city officials, and nationally recognized experts in sustainable development, finance, land use, real estate, and infrastructure to explore how cities can achieve a more resilient future.

Over the course of the two days of learning, discussing, and problem solving, participants focused on the land use, environmental planning, and economic development decisions that city leaders can make to strengthen communities and provide a higher quality of life for residents. The purpose of this year's summit was to offer participants access to land use tools and resources to advance resilience in their cities.

To achieve this, the summit:

- Offered participants information, greater motivation, and new resources to put resilience planning into action;
- Provided local officials a valuable and personal connection to leading experts in a variety of relevant fields;
- Shared specific examples of resilience in action to illustrate potential opportunities to pursue as well as pitfalls to avoid; and
- Generated creative new commitments to demonstrate collective leadership from participating cities.

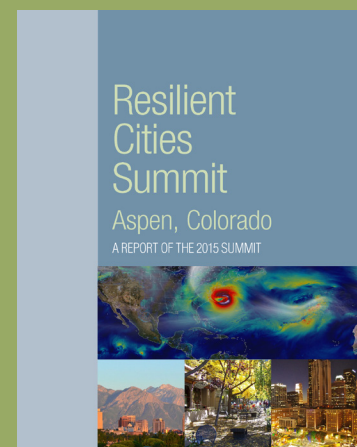
Key themes that emerged during the summit included the following:

- **Access to data and resources:** Data access, and the ability to use data for creative and effective communication, are critical for resilient decision-making and building community support.

2015 Resilient Cities Summit

The first Resilient Cities Summit in Aspen, Colorado, in 2015 focused on defining the issues. The discussion covered six topics:

- The complexity of resilience;
- Resilience as a leadership opportunity;
- Lessons in city resilience;
- Making the next resilience investment;
- Transforming conversation into action; and
- The global implications of U.S. city leadership.



- **Co-benefits:** Resilient infrastructure and land use practices that establish co-benefits aid in the pursuit of larger economic, social, and quality-of-life ambitions.
- **Design:** Design competitions can identify innovative approaches to further resilient development while creating partnerships that incorporate stakeholders who do not traditionally collaborate.
- **Communications and messaging:** A strong communication and messaging capacity is critical to elected officials' efforts to enhance resilience. Maintaining a clear understanding of the meaning of resilience and goals is imperative to successful implementation.
- **Creativity:** Innovative approaches create solutions to design programs and can generate new approaches specific to characteristics and goals of city.



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Cochair Mayor Mark Stodola.

WHAT IS RESILIENCE?

According to the American Planning Association (APA), the American Institute of Architects (AIA), the Urban Land Institute (ULI), and a number of other organizations that focus on the built environment, the definition of resilience is “the ability to prepare and plan for, absorb, recover from, and more successfully adapt to adverse events.”

As weather events become more frequent and intense due to climate change, disruptions and stressors become a common concern among city officials and residents alike. Addressing these issues requires projects and programs that offer multiple economic, environmental, and social co-benefits. The ability of a city to “bounce back” ultimately benefits everyone, providing evidence that bringing this concept to fruition is key to solving problems now and preventing hardship in the future.

KEYNOTE SUMMARY

Katherine Hammack

Former Assistant Secretary of the U.S. Army for Installations, Energy, and Environment

RESILIENCE

Just as each city is unique, each U.S. Army installation is unique. But they all have some areas in common—a resilient city or installation provides reliable communication and mobility; ensures continuity of critical resources; and provides and enhances manmade and natural resources. The ultimate objective is to “help cities become more resilient to the physical, social, and economic challenges that are a growing part of the 21st century.”

To ensure resilient Army installations capable of warranting ready, trained, equipped, sustained, and motivated soldiers, we must be able to maintain continuity of operation. Army installations must be resilient because they are critical military resources. Our installations both create and depend upon a regional economy. Soldier readiness is linked to installation resilience: the ability to withstand any sort of disruption and continue with the mission.

RISKS

As the U.S. Army manages our installation footprint, we are striving to reduce risk to our critical missions. We balance overlapping and sometimes competing priorities. For example, we are balancing our goal to increase energy security, surety, and reliability with goals to reduce fuel costs, use less imported sources of energy, and protect the environment. The risk factors and competing priorities are many. If we examine risks individually, we miss the collective effects that can degrade the ability of the Army to respond and execute its mission.

We focus local efforts on ensuring that water supply will be sufficient today and into the future for each of our installations. These efforts might include the increased use of reclaimed water for end uses that do not require potable water. This offsets some portion of the potable water that would otherwise be used. However, if we do not consider regional water supply issues, the solutions we apply locally could be inadequate to maintain an installation’s viability into the future.

Another example of risk to our installations is power disruption. Installations and surrounding communities are experiencing increased power outages due to the impact of natural disasters and aging electrical distribution systems. In the last ten years, we have seen a more than fourfold increase in power interruptions on our Army bases. Many cities are seeing the same challenges.

We have all seen the projections. Annual average land temperatures are projected to warm at least twice as much in the next 100 years as they have during the last 100 years. As a result of climate change, cities and bases must be able to adapt to uncertain and changing conditions. Climate-related disruptions and disasters are growing in frequency, intensity, and unpredictability.

Except under the most aggressive mitigation scenario studied, global average temperature is expected to rise. Ground-level air temperatures are expected to continue to warm more rapidly over land than over oceans. Northern areas are projected to become wetter, especially in the winter and spring. southern areas, especially the Southwest, are projected to become drier. Heavy precipitation will likely be more frequent, even in areas where total precipitation is projected to decrease. Heavy downpours that currently occur about once every 20 years are projected to occur two to five times as frequently by 2100, depending on location. The proportion of precipitation falling as rain rather than snow is expected to increase, except in far northern areas. Heat waves, droughts, wildfires, and floods are all occurring more frequently. This puts strains on already fragile ecosystems and hinders the ability of these areas to respond to and recover from shocks.

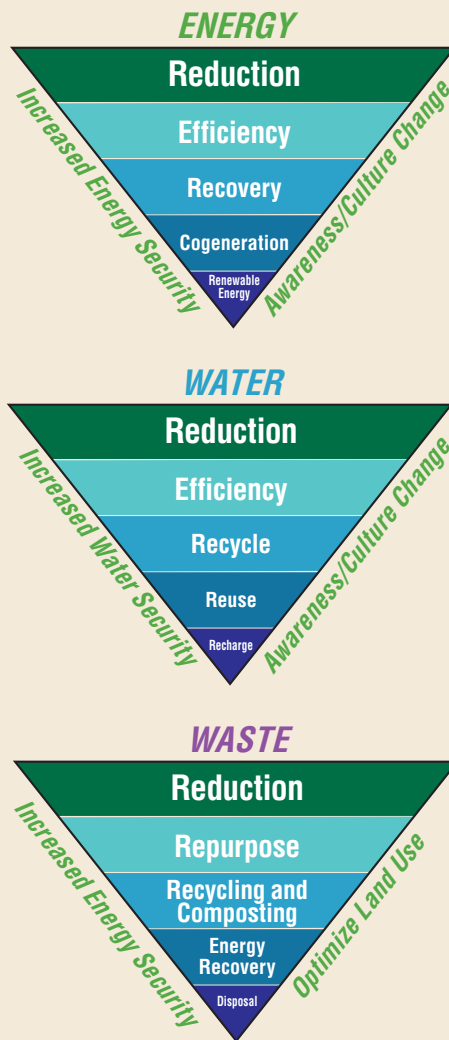
Climate change, for the U.S. Army, constrains training options and increases safety and occupational health risks. The increase in natural disasters translates into more missions since we provide support to civil authorities in emergency response and recovery operations.

NET ZERO

A key component of resilience is continuity of critical resources. The U.S. Army defines this through our Net Zero Strategy. This strategy comprises three components: Net Zero Energy, Net Zero Water, and Net Zero Waste.

The Net Zero Energy focus is first on energy reduction through conservation, followed by energy efficiency. Once energy use is reduced as much as possible and energy-efficient technologies have been implemented, then energy recovery and cogeneration should be investigated. Remaining energy loads are to be met with the use of on-site renewable energy sources. This approach enables a Net Zero Energy installation to produce as much renewable energy as it uses over the course of a year.

The Net Zero Water hierarchy is similar to that of Net Zero Energy. It begins with the reduction of water use from all sources, followed by improved efficiency. Installation decision makers identify the largest water uses and seek to perform the same functions with less water. These efforts are a top priority since they should have the greatest effect on reducing overall water use.



The Net Zero Waste hierarchy starts with the belief that reduction, or avoidance of waste altogether, is the most efficient strategy for minimizing waste. Repurposing or reusing waste products and materials is the next most efficient step. This ensures that the complete value of the goods is retained and that the reused goods are substituted for goods that would have been otherwise purchased new.

A resilient, net-zero installation requires a systems-of-systems, holistic approach. For example, it takes energy to pump, treat, distribute, collect, and dispose of water resources. And it takes energy to transport and properly dispose of waste.

CULTURE CHANGE

Building occupant culture change is critical to long-term resilience and sustainability. Because our energy and water costs are so high, even a small change can make a difference. The U.S. Department of Energy estimates that behavior change can reduce energy consumption by 3 percent to 10 percent per year. For the U.S. Army, that would mean annual savings of \$40 million to \$100 million, which could be used for mission needs.

Strategies range from “carrot” to “stick” programs to raise awareness and change behavior that occurs in and outside of U.S. Army facilities. Certainly, we try to use as many carrots as possible, such as individual and team awards, to encourage behaviors that increase energy and water efficiency and conservation, and increase recycling. Occasionally, we also use sticks when the kinds of behaviors that support our sustainability efforts are not being used. This might include having senior leaders highlight best and worst performers at their monthly update. This leadership attention and negative recognition can effect behavior change.

A challenge in commercial office buildings, and even on our bases, is that a tenant’s energy and water use may be based on the amount of square feet they occupy versus having utility meters that capture actual use. Without meter information, tenants have less-accurate data that they can use to reduce the energy or water they consume in the spaces they occupy. Behavior change can be increased, when actual use and behavioral effects are monitored and reported.

CONCLUSION

We know that to remain resilient, we must carefully manage limited resources to ensure facility use to the fullest potential. Sustainably operating our assets in a resilience framework ensures future operational flexibility by giving the children of tomorrow the same access to energy, water, land, and natural resources as today’s children.

Of course, the U.S. Army’s core mission is not energy conservation, asset management, or efficiency. Our mission will always be to fight and win our nation’s wars. But by partnering with the best from the private sector; working with neighboring communities and cities; applying the best mix of technologies; and attracting the best people—both soldiers and civilians, scientists and innovators—the U.S. Army will be

better prepared to defend this nation. Our facility assets will be more resilient and the Army more focused on making sure that soldiers are properly trained and fully equipped.

When like-minded leaders gather to share and learn from each other's endeavors, we can grow the body of knowledge. Our shared experiences then contribute to resilience and sustainability for the common good. Joint implementation of practical solutions, that meet multiple needs, is critical.

God bless you, God bless our soldiers serving in harm's way around the world, and God bless the United States of America.

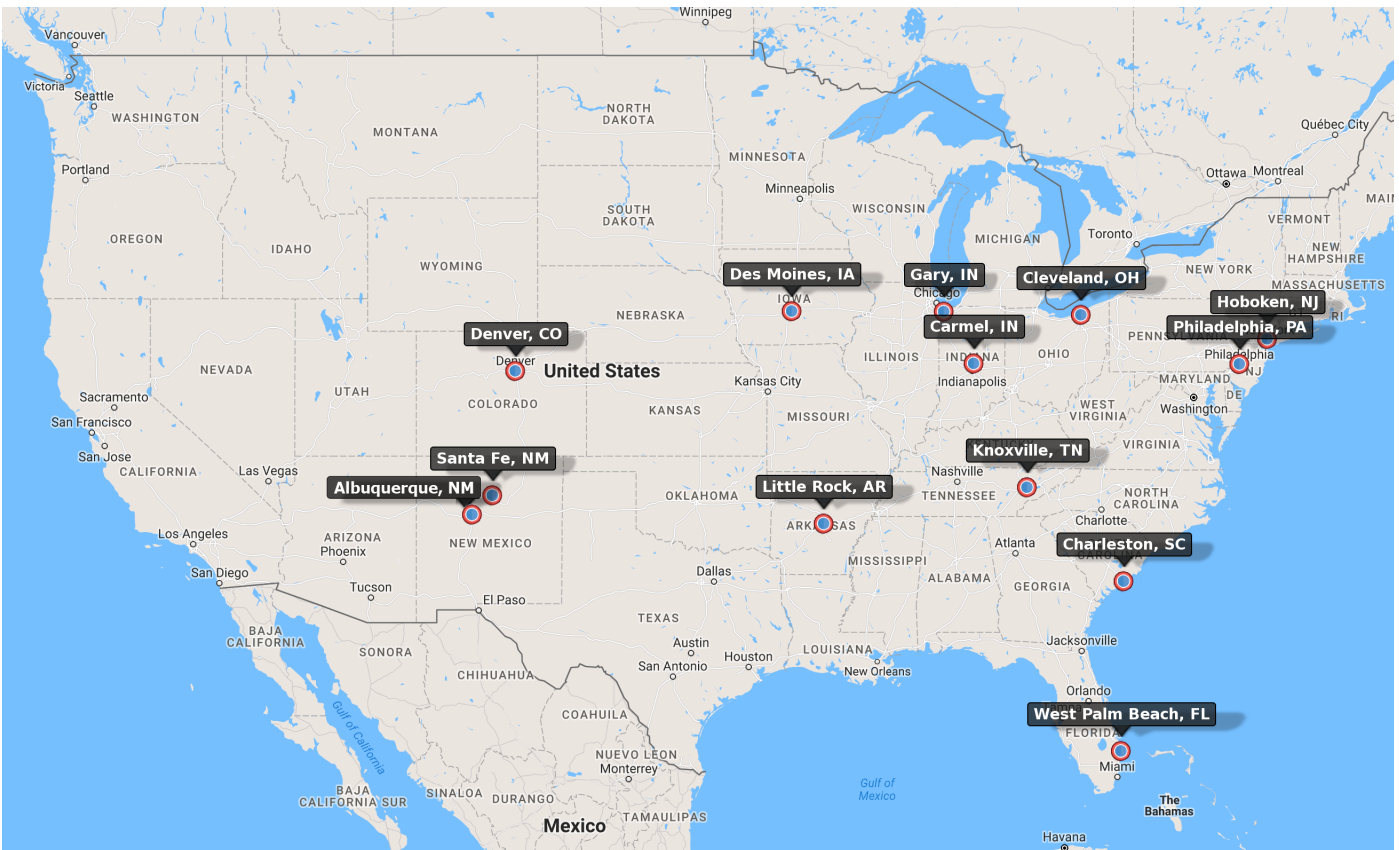
The U.S. Army manages billions of square feet of building space. According to Katherine Hammack, former assistant secretary of the U.S. Army for Installations, Energy, and the Environment, the Army recognizes that resilience is key to mission readiness. The Army's Net Zero Initiative is a holistic strategy founded upon sustainable practices to manage energy, water, and waste at Army installations.

Learn more at: www.asaie.army.mil/Public/ES/netzero/.

FOUNDATIONAL CONVERSATION ON RESILIENCE FOR LOCAL LEADERS

The summit welcomed 53 participants who represented a cross section of geographic locations, interests, and backgrounds from across the United States. Participants included mayors, city staff, environmental and sustainable development professionals, and others involved with resilience issues at the local, state, and national levels. Collectively, the group represented over 2 million residents and worked toward three main goals during their time at the summit:

- To problem-solve by taking advantage of the knowledge and experience of all the summit participants;
- To build and strengthen connections between participants and their constituents; and
- To reach a broad spectrum of cities, including those that may not have been represented at the summit.



Participants in this year's summit represented a wide range of locations across the United States.



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Amy Armstrong discusses lessons learned from 100 Resilient Cities.

To open the event, two presentations set the stage for discussion surrounding the capacity that cities have to be resilient and how to implement strategies on the ground to ensure that local goals are maintained and prioritized.

Amy Armstrong, vice president of knowledge and impact, 100 Resilient Cities (100RC), provided an overview of 100RC, which was pioneered and is supported by the Rockefeller Foundation. The nonprofit organization is dedicated to helping cities around the world build resilience to the economic, social, and physical challenges that are increasingly part of the 21st century. Resilience is defined by 100RC as the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow, no matter what kinds of chronic stresses and acute shocks they experience. Shocks are typically considered single-event disasters, such as fires, earthquakes, and floods. Stresses are factors that pressure a city on a daily or reoccurring basis, such as chronic food and water shortages, an overtaxed transportation system, endemic violence, or high unemployment. City resilience is about making a city better, in both good times and bad, for the benefit of all its citizens, particularly the poor and vulnerable. The aim of 100RC is not only to help individual cities become more resilient, but is also to facilitate the building of a global practice of resilience among governments, NGOs, the private sector, and individual citizens.

Scot Horst, chief product officer at the U.S. Green Building Council and CEO of Arc Skoru Inc., a technology company established to build the Arc platform, invoked Socrates, Plato, and Aristotle in his discussion of “What are the big ideas around resilience?” He put forth the view that sustainability and resilience should be viewed from a whole-systems perspective and that it is the job of leaders to help cultivate this view and encourage thinking, reflecting, and negotiating. Noting that USGBC strives to connect locally, regionally, and globally, he described how the Leadership in Energy and Environmental Design (LEED) green building program has become a global movement in 164 countries and territories, but still is always concerned with projects at the local level.

To help cities share information and create global connections, USGBC recently released two new certification programs: LEED for Cities and LEED for Communities. These offerings, built into the newly released Arc platform, support continuous progress toward better communities and cities, and a higher quality of life. Using these certification programs, a community or city sets goals and implements strategies and plans to maintain and support these goals. The city or community then shares performance data to measure and track performance progress toward those goals across a number of critical areas including energy, water, waste, transportation, and human experience. These offerings also allow communities or cities to gauge how they are doing compared with their local, regional, or global peers.



Scot Horst presents on the importance of the “whole-systems perspective.”

Following the two presentations, participants’ reactions sparked discussion revolving around three topics:

- Creating support and framing the conversation;
- Adaptability; and
- Tracking and performance.

CREATING SUPPORT AND FRAMING THE CONVERSATION

Building connections in pursuit of resilience requires interest and support at the local level. One of the questions that surfaced several times during the summit was: “How do we frame the conversation and find common ways of talking about issues and solutions?”

Participants pointed to a few scenarios where networks helped garner support for resilience issues central to their cities.

- Community leaders in Gatlinburg, Tennessee, gained support for rebuilding after their historic 2016 fire by finding a common language rooted in the community’s history and tradition of outdoor activities such as hunting and fishing.
- In Hoboken, New Jersey, a new park will create greater access to the waterfront while also improving resilience to flooding. In the planning stages, the city emphasized the project’s co-benefits to gain support.
- In Lafayette, Louisiana, recent floods have largely affected the low-lying suburban areas, leaving the downtown and its infrastructure intact. While planners have long identified the need to revitalize downtown, the floods have framed the issue in a new way and may help gain support for incentives to spur downtown development.

ADAPTABILITY

Adaptability also was a central theme of discussions, particularly city leaders’ ability to adapt to new processes and ways of thinking to generate innovative ideas. Hurricane Sandy was cited as an example of a disaster that led to greater focus on quality of design in its aftermath. In response to Sandy’s devastating impact on the East Coast, the U.S. Department of Housing and Urban Development (HUD), in partnership with nonprofit groups and the

philanthropic sector, created Rebuild by Design, a design competition to raise the bar for response, preparedness, and resilience. The Rebuild by Design Hurricane Sandy Design Competition became a model to help governments create research-based, collaborative processes to prepare for future challenges and find solutions for complex, large-scale problems.

TRACKING AND PERFORMANCE

The ability to quantify, track, and show the benefits of resilience measures is powerful. When facing new resilience challenges, cities should consider innovative tools and technologies, using tracking data to understand impact.

- The Arc Platform, created by Green Business Certification Inc. (GBCI), leverages comprehensive global data analytics to allow users to measure performance, make improvements, and benchmark against other projects. Arc is a complement to LEED and other green building rating systems, standards, protocols, and guidelines and allows buildings and spaces to compare performance metrics and connect those metrics to green building strategies. Arc enables incremental improvements and can put a project on track for LEED or other rating system certification.
- The ULI Greenprint Center for Building Performance takes meaningful, immediate, and measurable actions to generate real estate solutions that improve the environment through energy efficiency while demonstrating the correlation with increased property values. The center uses the collective power of its membership to lead by example in lowering carbon emissions by exploring and implementing energy-reducing technologies, and shares the performance results with the public through the *Greenprint Performance Report*. The report is the largest global collection of transparent, verifiable, and comprehensive property data that provides aggregate benchmarks and performance trends for the real estate industry.

LAND USE TOOLS AND LESSONS FROM 100 RESILIENT CITIES

Amy Armstrong of 100 Resilient Cities facilitated the Resilient Cities Summit, sharing lessons learned from 100RC's work building resilience around the world and integrating resilience thinking into local government.

Three years ago, 100RC was pioneered by the Rockefeller Foundation with an ambitious goal: to help cities worldwide build resilience to the growing social, economic, and physical challenges of the 21st century. After 1,100 applications were received, 100 urban pioneers were selected to spread the resilience movement across the world.

A consistent theme found within these cities has been the use of land use planning to achieve resilience goals.

Planning for Resilience: Innovative Land Use Policies for Building a Resilient City

Amy Armstrong

Vice President for Knowledge and Impact, 100 Resilient Cities

Many cities in the 100 Resilient Cities network have begun to explore new and creative approaches to land use planning for achieving their holistic resilience goals. Precisely because management of the built environment has the potential for significant economic, social, and political consequences, cities are—and should be—crafting their land use policies to achieve a “resilience dividend,” which provides multiple benefits for the city and its citizens, and jointly addresses social, environmental, and economic challenges.

For municipalities with serious financial constraints, land use tools—ranging from comprehensive plans to zoning, incentives, and building codes—can present a path toward great impact at relatively little cost. Thoughtful attention to the location, type, density, and timing of land use through regulations, public infrastructure investments, market incentives, and conservation of natural resources makes land use planning one of the most powerful tools a city has for regulating day-to-day activities and setting a vision for the future.

The 100RC global network of cities provides a valuable vantage point for understanding the variety of challenges and solutions its cities present. From this global vantage point, we have identified three emerging themes of creative ways to apply land use tools to advance resilience goals. They include designing and deploying land use to:

- Realize multiple benefits;
- Share risk and responsibility among all city stakeholders; and
- Rethink scales of influence.

Below, we profile projects from several cities that illustrate the kind of creative planning that addresses these themes. They present solutions that may resonate with other cities in our network, and beyond.

Planning for Resilience: Innovative Land Use Policies for Building a Resilient City *continued*

We recognize this as an important body of work for the future and plan to continue to engage our member cities as well as you, our broader community of readers, in the dialogue of how to best use land use tools to plan for a city's resilient future.

Realize Multiple Benefits

Land use tools regulate the use of physical spaces, often in pursuit of larger economic, social, or quality-of-life goals. As such, cities commonly manage development by restricting height and density, shifting development out of coastal zones or seismic areas to reduce the risk of flood and erosion, and creating commercial and retail centers to target investment. Creative design of a city's physical plans can engender both the explicit outcome of the plan, as well as realize other types of multiple benefits through single regulatory actions.

In Mexico City, several projects underway plan for flood prevention alongside the creation of green public space. They include various green and blue infrastructure methodologies and technologies that can capture rainwater, retain it for later use, and infiltrate it into aquifers. By building public space in concert with flood protection measures, the city is achieving the multiple benefits of creating the key public good of open space while also advancing flood mitigation. One example is the development of "Parque de la Viga," a blue/green infrastructure project that is intended to use the park for flood prevention, storing and reusing rainwater, recreation and public health, greater social cohesion, and spreading awareness of water conversation issues in cities.

Share Risk and Responsibility

There are limits to what city governments can do on their own. To build a more resilient future, stakeholders from across the city need to commit to resilience goals. Cities can help achieve this through land use policies that encourage co-investment among the public, private, and nonprofit sectors, and incentivize certain behaviors while discouraging risky ones.

Land use policy that distributes and shares risk with other city stakeholders helps institutionalize resilience by integrating it into the planning and policy of various sectors across the city, instead of keeping it the preserve of public authorities. Fortunately, planning that leverages land use to shift and share risk and responsibility with a variety of stakeholders is gaining traction across the globe.

In New Orleans, the City Planning Commission recently updated its Comprehensive Zoning Ordinance (CZO) to better reflect the city's resilience goals. A key update to the CZO was requiring most new development projects to manage the first 1.25 inches (3.1 cm) of stormwater on their site (and to submit their design plan for managing stormwater with their development permits). By making stormwater management a regular requirement of private parcels of land, the city is sharing the risk and responsibility of effectively managing stormwater—building additional redundant capacity citywide and resulting in a more effective approach to managing one of the city's key threats.

Planning for Resilience: Innovative Land Use Policies for Building a Resilient City *continued*

Rethink Scales of Influence

100RC member cities acknowledge that the resilience challenges they face often extend beyond jurisdictional borders. These range from regional watershed issues, to heat waves that affect migration patterns across a large area, to economic downturns at the national level. In response, cities have begun to reconsider how resilient land use policies and practices can cross natural and political boundaries, respond to a variety of physical scales, and consider different time horizons to assess future risk.

The Future of Resilient Land Use

Unlike disaster preparedness, urban resilience accounts for more than planning for a specific event. It entails strengthening a city's systems to better manage any disruption that may occur.

Traditional land use planning attempts to address known disruptions, and operates on assumptions about a future state, from population growth, to car use, to demand for certain kinds of development. However, the introduction of any number of chronic stresses or acute shocks could significantly change the trajectory of those assumptions.

Innovative land use should better account for this uncertainty, and build adaptable methods that can respond to changes in assumptions about the city's physical, economic, or social conditions.

One of 100RC's member cities, Norfolk, Virginia, has shown leadership in answering this challenge of uncertainty and formulating land use plans that better advance its broader resilience goals. In November 2016, the coastal city unveiled its Vision 2100, an initiative of its resilience strategy, that sets forth a plan for how the city can adapt itself for the 22nd century while being a model for other coastal cities.

Norfolk's Vision 2100 applies new planning tools to advance the city's holistic resilience strategy; it advances integrated thinking on the interplay between shocks and stresses; and it applies a risk and asset lens to how the city should manage its land. A particularly innovative approach is the creation of four "vision" areas, which look at the city's neighborhoods through both a risk and asset lens. The plan organizes the city based on neighborhoods' risk and asset profiles and proposes distinct strategies for each, including, for example: transferable development rights for homeowners in chronic flood areas; reduced development in high-risk areas; and refocusing investment in "high and dry" areas that have the potential to increase economic opportunity for the city's poorest residents. While other cities continue to rebuild in the same high-risk areas, Norfolk has outlined a more thoughtful approach, one that is honest about the risks and opportunities for the city's future.

This remapping of the city's intentions, both literally and figuratively, presents a bold example for how a city can plan for resilience, incorporating each of the above principles: achieving multiple benefits, sharing risk and responsibility, and rethinking scales of influence.

Read Armstrong's **full presentation** in her blog post for 100 Resilient Cities, published December 8, 2016.

Several tools can be used to help cities measure the effectiveness of resilience measures. Arup, supported by the Rockefeller Foundation, has created the City Resilience Index. Based on evidence from 28 cities and three years of research and analysis into what constitutes resilience, it is a tool that helps cities understand and measure their resilience in a systematic, globally applicable way. The index has 12 indicators and 58 subindicators.

Arup has also joined forces with the Regional Plan Association and Siemens on the Toolkit for Resilient Cities to measure the resilience of urban infrastructure. Research shows that technology is a key component of resilient and efficient infrastructure protection. Integrating resilience into all aspects of their planning and normal investment and maintenance cycles can reduce potential damages, enhance productivity, create a safe place to live, and save billions of dollars.

The impact of Hurricane Sandy made the issue of preparing for climate-related disasters more immediate in Boston. The city launched Climate Ready Boston to help plan for future impacts of climate change. The focus was on making the existing system work while making sure that every major new project included climate preparedness in its proposal.

Summit participants provided more examples of effective land use tools and techniques for getting residents involved:

- Norfolk, Virginia, hosted a “Retain Your Rain” workshop with funding and technical experts to assist citizens in constructing rain barrels and other water management tools to collect water on their own properties.

Climate Ready Boston

Since 1991, Boston has experienced over 20 events that have prompted federal or state disaster assistance. Most recently, Hurricane Sandy in 2012 caused extreme high winds, coastal flooding, and massive amounts of damage to real estate and infrastructure. During the week following the hurricane alone, more than 10 percent of Boston’s population in the flooded areas continued to face hardships including injuries due to evacuation or during repair/cleanup.

As a result, the impact of Hurricane Sandy made the issue of preparing for climate-related disasters more immediate in Boston. The city launched Climate Ready Boston in response, to help plan for immediate and future impacts of climate change without bypassing current city plans and systems. The plan includes four main components to create a more resilient city: updating climate factors and projections, completing a comprehensive vulnerability assessment of the three main hazards (extreme heat, stormwater flooding, and coastal/riverine flooding), determining eight focus areas, and applying climate resilience initiatives with time frames and key milestones. Based on vulnerability assessment findings, each of the three climate hazards requires different responses based on geographic scale, frequency, intensity, and projected growth; the plan assesses each of the hazards and the most vulnerable populations of each to addresses the gap in capacity.

Climate Ready Boston is an ongoing initiative with the Green Ribbon Commission and receives support from the Massachusetts Office of Coastal Zone Management.

Learn more at: <https://www.boston.gov/environment-and-energy/climate-ready-boston>.

- Philadelphia has made progress in promoting sustainable development through outreach efforts and Community Development Block Grant (CDBG) funds. The city offers free rain barrels, free trees, incentives for green roofs, and educational sessions on how to take care of them. The city also provides incentives and density bonuses for LEED Gold or Platinum projects.
- The Center for Neighborhood Technology, a nonprofit research and advocacy organization, has a Rain Ready initiative to help people manage flooding and drought in a time of climate change.
- With Kresge Foundation support, the Cleveland, Ohio, city council initiated the Climate Resiliency and Urban Opportunity Initiative, which focuses on four neighborhoods that are representative of different conditions found in Cleveland. A key feature is paid “climate ambassadors” who take on leadership roles in outreach.
- In the Upper Peninsula neighborhood of Charleston, a nonprofit organization called Enough Pie is connecting stakeholders using artistic collaborations, dynamic partnerships, creative placemaking, and civic engagement as tools.

Knoxville: Round It Up

Knoxville, Tennessee, uses several programs to advance energy efficiency within an aging housing stock and improve weatherization. In 2012, Knoxville was one of 31 cities selected to receive an IBM Smarter Cities Challenge® grant as part of IBM’s citizenship effort to build a Smarter Planet®. The Smarter Cities team provided insight into how to generate better data and give city officials ideas on how to optimize limited resources to achieve sustainable energy efficiency targets. With the assistance of this grant, the city created strategies to connect utility bill assistance with energy efficiency upgrades through the use of better data and effective governance measures. The city also received \$14 million from the Tennessee Valley Authority to retrofit homes to meet energy efficiency standards.

The Knoxville Utility Board’s monthly Round It Up program is an effective outcome of the Smarter Cities Challenge. This voluntary program secures funding for weatherization improvements by rounding up utility payments to the next whole dollar. This sustainable source of funding is used by the Knoxville–Knox County Community Action Committee (CAC) to provide assistance in the weatherization of homes, education, and training for low-income families. This assistance program helps those who have temporary or emergency needs as well as the city by promoting energy efficiency, creating jobs, and improving neighborhood housing conditions.

Learn more at: <https://www.kub.org/rounditup>.

RESILIENCE PLANNING: FIRST STEPS

A discussion on sharing information and possible “low-hanging fruit” solutions revealed some simple but effective programs around the United States:

- Little Rock, Arkansas, used an AmeriCorps team trained in weatherization techniques to assist residents. The team also found that 50 percent of homes surveyed had gas leaks as well.
- Knoxville, Tennessee, uses several programs to advance energy efficiency. Through assistance from the IBM Smarter Cities Challenge, the city created strategies to connect utility bill assistance with energy efficiency upgrades. The city also received \$14 million from the Tennessee Valley Authority to retrofit homes to meet energy efficiency standards.²
- In Charlotte, North Carolina, several homeownership and weatherization programs are available for low- and moderate-income families. Opportunities for funding resources have improved as the city’s real estate market has become more active: a real estate transfer tax and a bond issue have made funds available.³ The city is now looking at loan guarantees and interest rate buydowns for home repairs.
- Another recommended source is the Urban Sustainability Directors Network (USDN), a peer-to-peer network of local government professionals from cities across the United States and Canada that is dedicated to creating a healthier environment, economic prosperity, and increased social equity.

Participants agreed that there are lots of great ideas, but the challenge is the ability to access funds quickly, especially in emergencies. The *Green Muni Bonds Playbook* was noted as a good resource for this type of financing.

LOCALIZED RESILIENCE: UNIQUE APPROACHES FOR EACH COMMUNITY

Participants were asked the following question: How do we simultaneously build global networks and address a complex issue like resilience and deal with local issues?

Jim Heid, founder of UrbanGreen, addressed differences in addressing resilience in urban versus rural settings, considering his experience on several of the Urban Land Institute's Advisory Services panels focused on resilience. Some examples include the following:

- In rural Louisa County, Iowa, it was cheaper to buy up farmland to create preserves for flooding than to undergo expensive work on river levees.
- In suburban Bellevue, Washington, a robust economy allowed for a hard infrastructure improvement approach.
- In San Jose, California, the Guadalupe River Park and Gardens incorporates flood protection along the refashioned river channel and creates multiple economic and social benefits.⁴

PLANNING FOR DISASTERS

The breakout session began with a discussion of planning for disasters, both before and after. Participants agreed that resilience is not just about disaster recovery, but also about achieving better outcomes after a disaster occurs. In spite of the huge concern about planning for disasters, some participants cautioned about focusing too much on this type of disruption since it can distract from other issues affecting resilience.

Some local success stories described by participants are as follows:

- In Knoxville, Tennessee, a disagreement over development restrictions on ridge tops and hillsides eventually led to agreement on the importance of preservation for outdoor recreation and a larger economic development strategy. Over 1,000 acres (405 ha) were preserved in south Knoxville.
- By looking at resilience planning through a historical preservation lens, Charleston, South Carolina, placed over 17,000 structures under design review because they have found that in recent storms, the older structures often performed better than newer buildings. Charleston also has harnessed the diverse population living in its historic downtown district to build social resilience and create relationships at the block level and above that can come together during a disaster.
- In the state of New Mexico, the dependence on falling oil and gas revenues has shown the importance of economic resilience. The city of Albuquerque, New Mexico, has found that social infrastructure is as important as physical infrastructure.

BUILDING CODES

City leaders must also examine building codes to see whether they potentially prevent the right type of rebuilding to take place. It is not enough to plan for historic standards; it might be necessary to look at the possibility of a 1,000-year flood!

Sending the Resilience Message to Different Constituencies

Mayors discussed the challenges of sending the message about resilience to different constituencies. Everyone agreed that constituents want their elected officials to lead and to provide information in a clear and concise way. When working to be persuasive, it is important to emphasize shared values and goals before moving on to more controversial issues. It is useful to start the conversation by emphasizing that the risks are real. Describing the co-benefits to everyone, even those who may not be directly affected, is also important. Mayors noted that if resilience planning makes economic sense, it speaks to everyone.

Reaching out includes not just the right messaging, but also techniques to build trust:

- In Cleveland, “youth ambassadors” are used to help make resilience strategies relatable.
- In Knoxville, the Tennessee Wildlife Management Agency uses the message of “economic stability” as opposed to “climate change.”
- In Charleston, South Carolina, the issue of repetitive flooding has helped align rural, urban, and suburban populations.
- In West Palm Beach, Florida, a program of city giveaways, including rain barrels and low-flow toilets, has helped spread the message about sustainability.

Mayors also talked about the challenges of getting city staff onboard with sustainability and resilience efforts.

- In Cleveland, the Office of Sustainability was elevated to the cabinet level.
- In Knoxville, every city department is charged with responsibility for sustainability.
- In West Palm Beach, the Office of Sustainability was physically moved to within proximity of the mayor's office.



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Mayor Jeri Muoio shares lessons from West Palm Beach, Florida.

Lessons from Cleveland

Cleveland, Ohio, demonstrates resilience through several successful programs that can be personalized in other cities.

- Cleveland's EcoVillage, one of the first in the United States, is an economically and ecologically sustainable community with environmentally conscious, pedestrian-friendly designs.⁵
- The Office of Sustainability in Cleveland develops policies and programs to embrace a culture of sustainability. The city also holds an annual Sustainability Summit that engages hundreds of people around a particular sustainability subject. Through its programs, the office has been able to shift the thinking of leaders, funders, and citizens.⁶

A model of decentralized leadership encourages higher civic engagement, therefore turning ideas into actions. Of the 30-plus volunteer groups involved in sustainability, eight have turned into separate organizations.

An example of shared leadership is the Cleveland Tree Plan, a community-wide collaboration to rebuild the city's street tree forest, almost half of which has been lost since World War II.⁷



Councilman Matt Zone shares details about and lessons learned from Cleveland's citywide resilience programs.

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RESILIENCE IN ACTION: LEADERSHIP AND IMPLEMENTATION

Leadership and aid in implementation of activities related to sustainability and resilience can come from the federal level, according to **Danielle Arigoni**, director of the Office of Economic Development (OED) for the U.S. Department of Housing and Urban Development. The OED's mission is to assist low- and moderate-income families, the populations most severely affected by natural disasters and climate change. Acknowledging that the number of “billion dollar” disruptive events is growing, she noted that it is critical to put in place the policy structures for resilience at all levels.

HUD also supports or has supported resilience through the following:

- **Rebuild by Design:** Six projects totaling \$1 billion were supported after Hurricane Sandy.
- **Sustainable Communities Initiative:** From 2010 to 2015, it provided \$250 million in investment in comprehensive regional planning.
- **National Disaster Resilience Competition:** From 2014 to 2016, \$1 billion in projects was awarded and 200-plus state and local officials were trained on resilience.

HUD is also involved with the Community Solutions Task Force, an effort to enhance coordination across federal agencies to improve interactions with local government, nonprofit organizations, business, and other stakeholders.⁸



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Danielle Arigoni discusses approaches to resilience at the federal level.

IDENTIFYING AND COMMUNICATING THE NEXT RESILIENCE SOLUTIONS

To start Day 2, participants considered the range of issues and solutions that were addressed during the sessions on Day 1.

Mayors concurred that cities need to take the lead in finding and implementing resilience solutions. A private sector representative advised that mayors explore more ways to involve the business community. There may be players out there with whom they typically do not work, who want to get involved in planning for resilience.

The value of data in planning for resilience was emphasized, as was the concept of scalability.

The Resilience Spectrum

Charles Rath, president and CEO of Resilient Solutions 21 (RS21), a consultancy firm that uses data and visualization to enhance resilience planning, emphasized that resilience issues are complex and require a multidisciplinary approach. Therefore, the collection and analysis of large amounts of data call for an inspiring format in which to visualize the data.

RS21 offers the Resilience Spectrum to cities in the 100 Resilient Cities network. The Resilience Spectrum uses urban analytics and data visualization, and combines layers of physical, social, economic, and environmental data sets to help cities visualize complex data on a city-level scale.⁹

- In Charleston, South Carolina, the company helped set the context for the impacts of future hurricanes. It looked at possible hurricane paths and created a “heat map” of socially vulnerable areas in the city to show what areas would be affected, plus topography and buildings. The resulting three-dimensional map offers a quick and easy way to see the impacts. Because this tool is accessible and easy to understand, it works well in workshops.
- In two Mexican cities, the company created a map of youth violence in combination with other social factors. The resulting data suggested that access to community facilities in these areas was difficult.

SUCCESSFUL RESILIENCE INTERVENTIONS: THE SNOWBALL EFFECT

Participants discussed the snowball effect of successful resilience interventions. Again, they cautioned against the tendency to put too much emphasis on climate and water issues when there are many other potential disruptions to cities. Pre-planning is important to make sure there is time to consider the impact of actions taken after disruptions.

Carmel, Indiana, is an example of effective planning combined with public/private partnerships to create a lively and resilient downtown. Like many other cities that grew quickly after WWII, it did not have a strong central core. The city government undertook financial modeling as background to efforts to increase the density of development there. This analysis clearly showed the benefits of mid-rise development versus one-story buildings with expansive surface parking lots. With increased property tax revenue, it was possible to raise funds through tax increment financing to pay for an underground parking garage. In the future, it is expected that additional five-story buildings could help justify transit improvements.



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Mayor Jim Brainard shares effective planning techniques from Carmel, Indiana.

TAKEAWAYS FROM THE 2016 RESILIENT CITIES SUMMIT

The 2015 Resilient Cities Summit, held in Aspen, Colorado, explored the concept of resilience with a small group of elected officials. The group assembled discussed both how resilience relates to large-scale disasters and everyday stressors related to infrastructure, businesses, schools, and other facets of their communities. Discussions focused on how cities can invest in projects or programs that offer multiple benefits—responding to the “triple bottom line” of profit, planet, and people—and be ready to bounce back better after unexpected events.

The 2016 summit built from these topics to focus on how resilience relates to land use, and to the development and zoning tools that city officials often have at their disposal. City officials attending the summit walked away from the event with a better understanding of what is needed to build resilience within their communities and tools that can be used to get there. Zoning codes, building codes, comprehensive planning, and development incentives were among the tools discussed in the context of creating more resilient urban environments and supporting local communities, including the most vulnerable ones. Communicating the concept of resilience was also a key theme, and participants framed resilience as a discussion of strength and looked at the opportunities it brings to cities.

A key theme of discussions was data and the innovative use of data applications to build resilience and foster municipal decision making. Participants agreed that many cities already have the data needed to visualize scenarios and create solutions, but don't always know what is available and accessible. City officials discussed how to use available data and technologies as a reference throughout the decision-making process and as a tool for community engagement, focusing on both natural and manmade risks to establish baselines. Summit leaders also found that design competitions present an innovative approach to furthering community collaboration on resilient development and inspiring the private sector and other actors to generate innovative solutions.

The 2016 summit leaders agreed that to put resilience strategies into action, creative financing methods need to be used. The group discussed emerging opportunities, such as social impact bonds, as well as strategies for building private sector support for resilience and engaging stakeholders who do traditionally collaborate on this issue. By considering the business case of resilience, attendees discussed the importance of getting to know the private sector players within their community and speaking their language. To build from these established areas of interest and need, the 2017 summit will focus largely on innovative financing and implementation strategies for building resilience.



Participants from the 2016 Resilient Cities Summit.

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Jess Zimbabwe, Director of Urban Development, National League of Cities

Dawn Zimmer, Mayor, City of Hoboken, New Jersey

Matt Zone, President, National League of Cities, and Councilman, City of Cleveland, Ohio

Other Guests

Karen Cook, EECOM and USGBC New Mexico

Dale Dekker, Founding Principal and Architect, Dekker/Perich/Sabatini Ltd., and Committee Member, ULI New Mexico

Brad Hill, New Mexico Office of the Attorney General

Ed Mazria, Founder and CEO, Architecture 2030

Banu Büngül McKinley, District Council Coordinator, ULI New Mexico

SELECT RESOURCES FOR CITIES

Below is a select list of resources referenced during the 2016 Resilient Cities Summit discussion relevant to the implementation of resilience policies and programs.

- Sharing best practices and success stories helps foster resilience. ULI's Returns on Resilience project showcases real estate developments that incorporate resilient design measures. The 2015 ULI report *Returns on Resilience* includes ten detailed case studies based on interviews with developers and property owners about their resilience strategies, their design and development processes, and the resulting project performance.
<http://returnsonresilience.uli.org>
- ISO 14001 environmental management standards are used in city departments in Denver as practical tools to manage environmental responsibilities.
www.iso.org/iso/iso14000
- The City Energy Project is an initiative sponsored by the National Resources Defense Council and the Institute for Market Transformation to create healthier and more prosperous cities by improving the energy efficiency of buildings. The 20 cities involved in the project are models for communities nationwide.
www.cityenergyproject.org/about/
- Community development financial institutions (CDFIs) were noted as useful financial tools. These private financial institutions are dedicated to delivering affordable loans to low-income and disadvantaged populations.
<http://ofn.org/what-cdfi>
- In Little Rock, Arkansas, the mayor's Sustainability Commission helps communicate the benefits of sustainable measures. The commission organizes a Sustainability Summit, which focuses on success stories from across the United States.
<https://www.littlerock.gov/city-administration/mayors-office/mayors-commissions-task-forces/little-rock-sustainability-commission/>
- The Center for Planning Excellence (TCPEX) is a nonprofit organization that coordinates urban, rural, and regional planning efforts in Louisiana. Many useful tools can be downloaded from the organization's website.
www.cpex.org
- "Envision" is a sustainability rating system for infrastructure created by the Institute for Sustainable Infrastructure to guide project design internally and to help inform clients about the benefits of planning for resilience. Using this system encourages firms to invest in resilient cities.
<http://sustainableinfrastructure.org/envision/>
- The Great Lakes and St. Lawrence Cities Initiative offers climate readiness tools.
<http://gslscities.org>

For a longer list of helpful resources for city resilience, please see the report from the 2015 Resilient Cities Summit:
www.usgbc.org/resources/2015-resilient-cities-summit-report

NOTES

1. https://w3.siemens.com/topics/global/en/sustainable-cities/resilience/Documents/pdf/Toolkit_for_Resilient_Cities_Summary.pdf
2. <https://smartercitieschallenge.org>
3. www.knoxvilletn.gov/UserFiles/Servers/Server_109478/File/Sustainability/SmarterCities/finalreport.pdf
4. www.grpg.org/river-park-gardens/
5. www.dscdo.org/ecovillage.aspx
6. www.city.cleveland.oh.us/CityofCleveland/Home/Government/CityAgencies/OfficeOfSustainability
7. www.city.cleveland.oh.us/sites/default/files/forms_publications/ClevelandTreePlan.pdf
8. <https://communitysolutions.sites.usa.gov/about-us/>
9. www.resilientsolutions21.com



A Extensive Vegetated Roofing System



B Photovoltaic Roofing System



C Hot and Cold Built-Up Roofing System



D Single-Ply Roofing System



E Hot and Cold Modified Bitumen Roofing System



F Restoration Coatings, Roofs and Walls



G Metal Roofing System



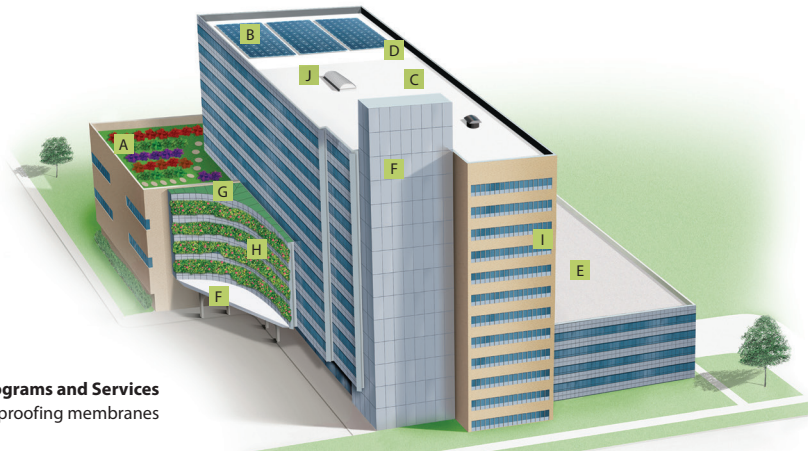
H Living Wall System



I Air Barrier Solutions



J Commitment to Safety



Additional Products, Programs and Services

- Vegetated roofing waterproofing membranes
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- Air and water mitigation
- Roof recycling
- Sustainable products and programs

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