

Urban Resilience Program

White Paper Series

Resilience Strategies for Communities at Risk

About the Urban Land Institute

THE MISSION OF THE URBAN LAND INSTITUTE is to provide leadership in the responsible use of land and in creating and sustaining thriving communities worldwide. ULI is committed to

- Bringing together leaders from across the fields of real estate and land use policy to exchange best practices and serve community needs;
- Fostering collaboration within and beyond ULI's membership through mentoring, dialogue, and problem solving;
- Exploring issues of urbanization, conservation, regeneration, land use, capital formation, and sustainable development;
- Advancing land use policies and design practices that respect the uniqueness of both the built and natural environments;
- Sharing knowledge through education, applied research, publishing, and electronic media; and
- Sustaining a diverse global network of local practice and advisory efforts that address current and future challenges.

Established in 1936, the Institute today has more than 32,000 members worldwide, representing the entire spectrum of the land use and development disciplines. Professionals represented include developers, builders, property owners, investors, architects, public officials, planners, real estate brokers, appraisers, attorneys, engineers, financiers, academics, students, and librarians.

ULI relies heavily on the experience of its members. It is through member involvement and information resources that ULI has been able to set standards of excellence in development practice. The Institute has long been recognized as one of the world's most respected and widely quoted sources of objective information on urban planning, growth, and development.

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Introduction

TWO INDISPUTABLE TRENDS are converging to make the need for urban resilience urgent. First, global urbanization is occurring at a fast pace, with people concentrating in cities, many located in coastal regions or along major rivers. Second, the climate is changing in unpredictable ways, with the warmer atmosphere and higher sea levels being joined by a range of dangerous weather events that are affecting coastal and inland communities alike. Severe hurricanes like Katrina and Sandy as well as tsunamis and typhoons such as those that have devastated parts of Asia in recent years are no longer “storms of the century” but instead more common events. Record droughts, flooding, forest fires, and heat waves are occurring at increasing rates across the United States and elsewhere around the world.

In 2013, the Urban Land Institute signaled its commitment to providing leadership on urban resilience in the face of climate change. Early that year, ULI convened an interdisciplinary group of stakeholders to explore the real estate implications of environmental risks in coastal regions. That forum and the report that resulted from it, *Risk & Resilience in Coastal Regions: A ULI Global Policy and Practice Forum Report*, represented the first step in framing a broader set of activities that likely will engage many coastal communities for years to come.

In October 2013, ULI published the recommendations made by the groundbreaking Advisory Services panel conducted in New York and New Jersey following Hurricane Sandy. That report, *After Sandy: Advancing Strategies for Long-Term Resilience and Adaptability*, recommended 23 resilience strategies for the region. And in fall 2013, the Kresge Foundation awarded a major grant to expand ULI’s resilience work, which will include several resilience-themed Advisory Services panels modeled after the Hurricane Sandy panel.

This white paper adapts the recommendations in *After Sandy* and draws on themes in *Risk & Resilience in Coastal Regions* to demonstrate that core resilience strategies can be applied to communities around the world. Those strategies fall into four categories: (1) land use and development; (2) infrastructure, technology, and capacity; (3) finance, investment, and insurance; and (4) leadership and governance. The 23 recommendations in *After Sandy* have been recast here to reveal their applicability to communities at risk beyond the East Coast of the United States. In so doing, this white paper encourages public leaders and private stakeholders to use those strategies as a resource and to take actions appropriate for their communities and regions.

While there is no standard approach to resilience, the tools, policy changes, and strategies presented here serve as a blueprint and must be taken in conjunction with one another in order to succeed. Most important, resilience strategies must constantly evolve as new information becomes available and needs become clearer. A one-shot effort will not suffice; most of what is needed to meet the needs presented by the rapidly changing climate requires the evolution of land uses, building typologies, and regional infrastructure over decades.

As stated in *Risk & Resilience*: “Innovation in coastal land use practices, building standards, and urban infrastructure can help mitigate the growing risks presented by weather volatility and sea-level rise, while enhancing the livability of communities and strengthening their economic base, as well as restoring the integrity of natural resources.” Through its wider program of work as well as through this blueprint, ULI hopes to spur innovation in, advance the dialogue on, and develop and disseminate best practices for urban resilience.

Understanding Resilience and Climate Change

In order to take strategic actions to protect urban communities against climate-related disasters, it is important that decision makers understand what resilience is and the ways in which the climate is changing.



ANTHONY QUINTANO

Hurricane Sandy dropped Seaside Heights' JetStar roller-coaster into the Atlantic Ocean.

These topics are addressed in the following excerpts, adapted from *After Sandy* (“Bouncing Forward”) and *Risk & Resilience in Coastal Regions* (“An Overview of Climate Change in the United States”).

Bouncing Forward

A way of looking at resilience is the ability not only to bounce back but also to “bounce forward”—to recover and at the same time to enhance the capacities of the community or organization to better withstand future stresses.

“In this way of thinking, then, resilient communities, people, and systems have the ability to thrive, improve, or reorganize themselves in a healthy way in response to stress; that is, they are less vulnerable to breakdown in the face of shocks and stress. . . . Resilient systems, communities, or people recover their normal states more quickly after stress and are capable of enduring greater stress. They demonstrate greater adaptive capacity and can maintain ‘system functions’ in the event of disturbances. This capacity applies to the ability to withstand acute, immediate, and sudden stresses as well as long-term chronic challenges.

Most discussions of resilience agree that it is a multifaceted concept and should be understood and measured across multiple social dimensions, including physical, social, economic, institutional, and ecological fronts.”¹

Most experts in the field consider certain qualities essential for the development of resilience in urban regions. Any urban region is a system made up of many parts, many of which themselves are systems. Given the human capacity to change and adapt in the face of challenges and changing circumstances, these regions can be considered what in systems theory are known as complex adaptive systems.

“In Complex Adaptive Systems, three key properties contribute to resilience:

“*Diversity and Redundancy.* The functioning and adaptive capacity of the system does not depend on any single component, community, or individual, and multiple parts of the

system can substitute if one component fails.

“*Modular Networks.* The system comprises multiple smaller systems that are relatively independent of each other, complement each other, to a certain degree replicate each other, and are buffered from each other to minimize the transmission of shocks. Connections between subunits are necessary to enable the system to function as a whole, but structures exist to prevent the propagation of failures.

“*Responsive, Regulatory Feedbacks.* Structures or processes exist to transmit learning throughout the system. These feedback loops must be horizontal and vertical to maximize adaptability. Feedback loops must be understood as broadly as possible; for example, to include social-ecological feedback loops as well as feedback loops within traditional social or governance systems.”²

1. Judith Rodin and Robert Garris, “Reconsidering Resilience for the 21st Century.” In *USAID Frontiers in Development*, edited by Rajiv Shah and Steven Radelet (Washington, DC: U.S. Agency for International Development, 2012), PDF e-book, pp. 110–11.

2. *Ibid.*, pp. 114–15.

An Overview of Climate Change in the United States

The following summary is taken from the 2013 draft *National Climate Assessment Report*, prepared by the U.S. Global Change Research Program, a collaboration of 13 federal science agencies. Released by the government in January 2013, it represents the most recent consensus-based scientific report available on climate change. Its findings include the following:

Climate change. Global climate is changing and is projected to continue to change over this century and beyond.

Temperature. The average temperature has risen about 1.5 degrees Fahrenheit since 1895, with 80 percent of this increase occurring since 1980. The most recent decade was the warmest on record. Warming is superimposed on a naturally varying climate and has not been,

and will not be, uniform across regions over time. Temperatures are projected to rise between three and eight degrees Fahrenheit by 2100, depending on the region and projected future emissions scenarios.

Average precipitation. Average precipitation across the United States has increased since 1900, but some regions have seen decreases. The Midwest, southern Great Plains, and Northeast have had the largest increases. Portions of the Southeast, Southwest, and the Rocky Mountain states have had decreases.

Extreme precipitation. Heavy downpours are increasing in most regions, with the largest increases occurring in the Midwest and Northeast. Further increases in frequency and intensity of extreme precipitation events are projected for most areas.

Extreme weather. Certain types of extreme weather events have become more frequent and intense in some regions, including heat

waves, floods, and droughts. The increased intensity of heat waves has been most prevalent in western regions. Many of the intense flooding events have been in eastern regions.

Hurricanes. There has been an increase in the overall strength of hurricanes and the number of strong hurricanes in the North Atlantic since 1980. The intensity of hurricanes is projected to increase as the oceans continue to warm.

Sea levels. The global sea level has risen by about eight inches since reliable record keeping began in 1880. It is projected to rise an additional one to four feet by 2100 and will vary across regions.

Ocean acidification. Oceans are absorbing about a quarter of the carbon dioxide emitted to the atmosphere annually and as a result are becoming more acidic.

Source: 2013 draft *National Climate Assessment Report*, U.S. Global Change Research Program, January 2013, <http://ncadac.globalchange.gov/>.

Strategies and Recommendations

The following strategies and recommendations for long-term resilience, adapted from *After Sandy*, are designed to be more strategic in nature, rather than precise and detailed, in order to give communities flexibility in adapting them to address their particular needs.

A destroyed beach house in Far Rockaway, New York.



LEONARD ZHIKOVSKY, SPRIARTIST

Land Use and Development

Land is developed—and used—to maximize its market and social value. The long-term market value of a development, however, is difficult to assess accurately given the uncertain effects of climate change. It is critical that the right tools be developed and implemented to improve a community's capacity and mitigate risk.

1. Create an ongoing resilience task force. As the U.S. Department of Housing and Urban Development notes on its “About the Hurricane Sandy Rebuilding Task Force” web page, the main objective of a federal resilience task force should be to drive and ensure “cabinet-level, government-wide, and region-wide coordination to help communities as they are making decisions about long-term rebuilding.” Instead of creating a task force after a disaster strikes, ULI recommends creating a task force that proactively drives appropriate policy and planning decisions well in advance of an event.

2. Promote regional coordination. Interconnected infrastructure networks are regional in scope, but they also have neighborhood-by-neighborhood impacts. A change in the way local governments organize themselves might be needed to build an infrastructure framework that is flexible, that is sensitive to community context, and that supports the development of capacity for local disaster planning and response decision making. Regional protection demands cooperation among people and governments that share geomorphology. Without well-informed collective decision making about priorities and methods, any major new protective works a region wishes to undertake will be realized slowly, if at all, and their effectiveness will be reduced.

3. Identify those parts of your region to protect and invest in that are critical to your regional economy, culture, and health, safety, and welfare. Every region

has areas that are of special importance to its economic vitality and well-being. In addition, there are areas that are essential to its health and welfare, and to its unique cultural and historic heritage. An essential task of regional coordination is to identify these priority areas for protection and investment long term, given that resources are finite and all desirable projects cannot be undertaken.

4. Identify local land use typologies in order to assess the built environment for resilience. The first step in determining a region's capacity for resilience and in developing and implementing the right tools to improve that capacity is to conduct an assessment of existing land use typologies and local resources to determine the unique vulnerability of each. Identifying typologies requires taking into account environmental, political, cultural, and economic conditions, as well as the locality's density, transit access, scale, and so forth. The ability of a region to prepare and respond to future events is really the sum of the abilities of each of its localities.

5. Use defined land typologies in a cost/benefit analysis to identify less vulnerable “value zones” for long-term planning and public spending. Climate change's impacts have forced many communities to rethink the ways in which their land is used. Many are facing the politically challenging task of balancing the desire to continue existing land uses for homes and businesses with often dramatic increases in the costs of protecting and rebuilding those structures determined to be at risk. In responding to the costs of preserving and protecting certain high-risk locations, communities will need to develop new land use overlay zones that balance the value of continuing their current use with the cost of doing so. As jurisdictions face this reality, over time it will lead to new policies, investment strategies, and outcomes that will shift investment from most high-risk areas to those less vulnerable.

Infrastructure, Technology, and Capacity

Investing in infrastructure, technology, and capacity building not only serves to protect the lives, health, and well-being of those living in a community, but it will also make the community and its region more competitive for scarce public resources and more attractive for private investment.

6. Develop a regional infrastructure vision, review it regularly, and set priorities. It is essential that a vision of a comprehensive infrastructure framework be created that relates to the growing demand and unique physical characteristics of a region as a coherent whole, not as a series of independent parts. Because funding will never be sufficient for designing and (re)building all elements of a region's comprehensive infrastructure system at once, priorities need to be set regionally for which systems need upgrading for resilience first.

7. Consider long-term resilience when evaluating (re)building strategies. Cost/benefit analysis of infrastructure investments is an excellent tool for regional decision makers to use in order to comprehensively evaluate implementation strategies of long-term resilience. To select a rational sequence and strategy for implementing resilience measures, criteria for prioritization need to be established that include a cost/benefit assessment of criticality of need, protection of market value, and potential market value to be created, among other factors.

8. Design protective infrastructure to do more than protect. Because protective infrastructure can serve multiple functions, it can be of great economic and ecological value if it is designed in a way that contributes to the creation of new development opportunities, doubles up to accommodate other infrastructure uses, improves the quality of the public realm, and enhances natural systems.



Construction of a cofferdam in New Orleans by the U.S. Army Corps of Engineers.

U.S. ARMY CORPS OF ENGINEERS

9. Explore the potential of soft systems. A multi-functional approach to infrastructure can occur through design of soft (natural and landscape systems) and hard infrastructure. Regions that carefully consider infrastructure networks as tools for resilience will be well-positioned on the forefront of integrating more soft infrastructure into the overall system. Incorporating soft infrastructure can be a cost-effective way to build systems that protect people and valuable assets.

10. Allow for safe failure of some noncritical infrastructure systems. Certain elements of a city and region's infrastructure, though important, can be allowed to fail. Short-term interruptions of certain systems can be permitted and planned for to allow more investment and support for life- and safety-critical systems.

11. Create infrastructure recovery plans for quick partial service restoration. Priorities for restoration should be set by stakeholders, and the infrastructure system should be designed, to the extent possible, to accommodate those priorities quickly in the wake of a disaster. This objective could be approached through stages of restoration that focus on bringing power back to high-priority infrastructure first.

12. Encourage individual preparedness during short-term infrastructure outages. Those in areas at risk for power outages, interrupted transportation, or property damage should be ready for a wide range of system disruptions in the case of a disaster. The public should not presume that infrastructure systems will operate perfectly post-disaster. To prepare, citizens will require reliable, frequent, and timely distribution of information from the public sector. Historically, social networks and community-based organizations have been the most successful providers of immediate relief after a disaster and are often a secondary source of ongoing relief. For

relief to be possible, these organizations need to be prepared with goods to support the needs during power outages and other interruptions, as well as during the rebuilding efforts that follow.

Finance, Investment, and Insurance

Capital is the lifeblood of infrastructure and real estate development and rebuilding. Without sufficient funds, it is impossible to make the improvements necessary to prepare for future extreme weather events and to rebuild after them.

13. Implement creative extramunicipal financing mechanisms. Because of the magnitude of capital requirements and the frequently multijurisdictional scope of many infrastructure improvements, these projects can only be undertaken by federal or state agencies in cooperation with local municipalities or through a regional authority empowered to raise capital. There is often a gap in funding sources for infrastructure projects. Thus, it is incumbent upon states and regions to coordinate and create their own resilience funding authorities.

14. Revise federal funding assistance to allow local discretion and direct funding flows to communities when possible. Disaster recovery money from the federal government comes with designated specific uses that limit the flexibility of towns and cities in spending to improve multiple infrastructures simultaneously. Typically, federal assistance funds singular, single-use projects. There are too many non-discretionary resources and too few human resources to integrate them effectively in this manner. If federal assistance were more flexible, infrastructure investments would be more powerful and would serve communities more effectively.



A notably darker lower Manhattan, which is anchored by Wall Street, after Hurricane Sandy disrupted power.

15. Provide small communities with financial support to replace lost local tax dollars. When needed and appropriate, consideration should be given to creating a state disaster and financing mechanism to offset the loss of property taxes in communities that restrict redevelopment of sites where properties have been destroyed and instead dedicate the land to public purposes, such as natural infrastructure. As part of this proposed program, any turnover of land whose cost is offset in this way should be deeded for public use in perpetuity.

16. Accurately price climate risk into property value and insurance. Risk must be priced accurately. That said, much more study and information are required, especially with respect to flood insurance because scientific and engineering understanding of flood risk is rapidly evolving. Insurance pricing should be examined

to determine whether market distortions are occurring because of misunderstanding of climate events: in some areas, insurance premiums have increased in response to climate events for types of insurance coverage not directly affected by such events. Furthermore, certain insurance markets still require federal backstops, both for catastrophic risk and to support a graduated transition for lower-income communities to full risk pricing.

17. Allow partial compliance and mitigation measures in order to create flexibility in insurance premiums. Appropriate reductions in premiums should be considered in flood mitigation programs even if properties fail to fully meet local, Federal Emergency Management Agency (FEMA), or flood insurance requirements. These measures may be appropriate in circumstances in which it is impossible or prohibitively expensive to

raise the elevation of the building or to implement other zoning requirements. Integrating careful assessment of the value of flood mitigation efforts should also encourage investment in retrofits, which can reduce the impact (cost, duration, displacement) of future extreme climate events and thereby protect major private market investments. A similar analysis should be applied to areas at risk of forest fires or wildfires.

18. Design financing to help relieve the recovery burden for low-income households and small businesses. Lower-income households—both homeowners and renters—and small businesses without substantial savings are disadvantaged in financing their recovery after disaster strikes. A number of possible financing mechanisms exist that federal, state, and local authorities might consider to finance or relieve some of this burden. It is vital, however, that subsidies and tax abate-

ments not distort an individual's or business's decision-making process on whether or how to rebuild in certain areas. Individuals and communities need to rebuild, but that does not mean all rebuilding should necessarily be subsidized. Any subsidies or tax abatements provided by the government should be strategically targeted to designated value zones or other circumstances where rebuilding is a priority.

Leadership and Governance

Government is the structure that allows good leadership to flourish, and good leadership provides the guidance and willingness to make difficult decisions. Careful attention must be paid to the balance between high-level decision making that requires coordination among different levels of government and the need to allow localities the autonomy to make context-sensitive decisions for their communities.



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A scene of destruction in New Orleans following Hurricane Katrina in 2005.

19. Devolve funding to the lowest effective level where appropriate. Resources should be devolved to the lowest level of government—such as village, township, or city—that can demonstrate capacity to both manage and implement these funds and coordinate decision making regionally.

20. Enhance the capacity for coordination and collaboration among different levels of government—from local to federal. To promote regional coordination among diverse localities while preserving their autonomy and character, federal and state governments should provide clear incentives to encourage regional cooperation. The lowest level of government—such as village, township, or city—should both manage and implement these funds and coordinate decision making with the regional entity, if it can demonstrate the capacity to do so. The federal and state governments should also provide clear incentives to encourage cooperation among neighboring localities to create local planning clusters.

21. Build capacity for decision making at the local level. Many localities lack capacity and need greater access to information and resources, as well as the support of coordinating entities at higher levels of government. Resources and expertise from other levels of government must have greater duration and continuity than they do currently. Information systems and sharing agreements among communities are needed, and they can be facilitated or encouraged by a federal or regional coordinating body. The federal government needs to institute, and make permanent, a series of training sessions for local governments to teach them how to prepare for and respond to disasters. These sessions should include both elected officials and key staff.

22. Create programs to provide knowledge sharing and professional training. As communities plan for a resilient future, climate change is a factor that must be incorporated into education, training, and professional practices. The entire professional spectrum of advisers whom communities and individuals rely on for professional services—including architects, engineers, planners, design professionals, surveyors, and appraisers, as well as investment professionals who contribute to the underlying analysis of investment decisions—must be technically expert in areas that will be integral to decision making and implementation of both mitigation and resilience strategies and practices.

23. Make critical information easily understandable and readily accessible before, during, and after a disaster. The politics of difficult decisions can paralyze a community, or it can create the collective will to change. The ability to provide a series of grounded facts and to create an environment in which discussion of these facts and their consequences can take place makes change more likely. The long-term resilience of communities depends on hundreds of thousands of individual decisions by property owners—some in suburban and rural communities and some in urban neighborhoods. The quality of those decisions will depend in large part on good information. The critical information that people need to make informed decisions—such as base flood evaluations, availability of funding, the cost of insurance, the availability of buyouts, building codes that will be required in flood- or fire-prone areas, and maps of projected sea level rise prepared by the National Oceanic and Atmospheric Administration (NOAA)—is often not easily understood or attainable by individuals but is essential to sound decision making.

Conclusion

Preparing communities and regions for long-term resilience is a complex process requiring vision, setting of priorities, cooperation, and action sustained over a long period. It requires close collaboration among the public, private, and nonprofit sectors. It requires data, analysis, and continuous innovation and refinement. Most especially, it requires public leadership and public support. This white paper outlines some of the tools, strategies, and policies needed for leaders to advance resilience efforts in their communities.



OFFICIAL WHITE HOUSE PHOTO/PETE SOUZA

President Barack Obama was greeted by residents asking for help during his visit to areas devastated by Hurricane Sandy.

Project Team

Authors

Nicholas Lalla
Project Manager
Analyst to the CEO and Chief Content Officer

Gayle Berens
Senior Vice President
Education and Advisory Group

Uwe Brandes
Senior Vice President (former)
Initiatives

John McIlwain
Senior Resident Fellow/J. Ronald Terwilliger
Chair for Housing

Katrina Flora
Intern (former)

Project Staff

James A. Mulligan
Senior Editor

Betsy VanBuskirk
Creative Director

Anne Morgan
Designer

Craig Chapman
Senior Director, Publishing Operations

ULI Senior Executives

Patrick L. Phillips
Chief Executive Officer

Kathleen B. Carey
Executive Vice President/Chief Content Officer

Cheryl Cummins
Executive Officer

Michael Terseck
Chief Financial Officer/Chief Administrative Officer

Jason Ray
Chief Technology Officer

Lela Agnew
Executive Vice President, Communications

David Howard
Executive Vice President, Development and ULI Foundation

Joe Montgomery
Chief Executive, Europe

John Fitzgerald
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Marilee Utter
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