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# Building Resilient Cities

## FROM RISK ASSESSMENT TO REDEVELOPMENT

A joint publication of Ceres, The Next Practice, and the University of Cambridge Programme for Sustainability Leadership



**This paper by urban strategist Jeb Brugmann is one of three documents arising from the “Building Climate Resilience in Cities” workshop series.** It explains one of the core concepts developed through our workshop series. This new strategic planning framework, called a “Resilience Zone” is introduced and explored through a four-stage development process.

**A second, accompanying document,** “Building Climate Resilience in Cities: Priorities for Collaborative Action,” distills the key priorities that emerged from the workshop series for collaborative action between key urban stakeholders to build climate resilience in cities. This concise summary is designed to be readily understood so as to catalyze and expand cross-sector collaboration.

**A third set of documents** in this set contains the workshop materials including templates and graphics that were used to facilitate each of the workshops in the series. We are making these available so that city leaders and other urban resiliency stakeholders may consider their use when organizing their own multi-stakeholder workshops.

November 2013

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## ABOUT THE ORGANIZATIONS BEHIND THIS DOCUMENT

A collaborative and creative process involving multiple organizations and individuals has informed the “Building Climate Resilience in Cities” workshop series. The following is a list of the major parties that provided their time, ideas and expertise in various aspects of the endeavour.

**Ceres** ([www.ceres.org](http://www.ceres.org)) is a US-based organization that advocates for the adoption of sustainable business practices and solutions to build a healthy global economy. Ceres Insurance Program is working with leaders and investors in the insurance industry to set new standards and expectations that can enable insurers to plan for emerging climate risks while moving companies and individuals toward low-carbon activities. With ClimateWise, Ceres convened insurance industry leaders to inform and participate in the workshop series.

**ClimateWise** ([www.climatewise.org.uk](http://www.climatewise.org.uk)) is a global insurance industry leadership group to drive action on climate change risk. The group leverages the insurance industry’s expertise to better understand, communicate and act on climate risks and members commit to act on the ClimateWise Principles, against which they are independently reviewed annually. With Ceres, ClimateWise convened insurance industry leaders to inform and participate in the workshops series.

### **The University of Cambridge Programme for Sustainability Leadership (CPSL)**

([www.cpsl.cam.ac.uk](http://www.cpsl.cam.ac.uk)). CPSL’s mission is to build strategic leadership capacity to tackle critical global challenges. We deepen leaders’ understanding of the social, environmental and economic context in which they operate and help them respond in ways that benefit their organisations and society as a whole. CPSL provides the global Secretariat for ClimateWise and helped to conceive, convene and deliver the workshop series with ClimateWise and its partners.

**ICLEI-Local Governments for Sustainability** ([www.iclei.org](http://www.iclei.org)) is a global network of more than 1,000 local governments leading on sustainability and resilience. ICLEI offers a comprehensive approach to help cities and towns achieve their goals through technical assistance, tools, networks, and leadership recognition. Both ICLEI USA ([www.icleiusa.org](http://www.icleiusa.org)) and ICLEI Canada ([www.icleicanada.org](http://www.icleicanada.org)) helped to craft the program and convene city stakeholders participating in workshop series.

**The Insurance Advisory Panel** provided guidance throughout the design, development and conduct of the insurer-city workshop series. The Insurance Advisory Panel was composed of senior executives representing Aviva Canada (<http://www.avivacanada.com>), The Co-operators Group Ltd ([www.cooperators.ca](http://www.cooperators.ca)) and Swiss Re (<http://www.swissre.com>) who came together to provide insurance sector leadership to this endeavour.

**The Next Practice Ltd.** ([www.thenextpractice.com](http://www.thenextpractice.com)) is a business innovation consultancy that works with clients to develop investment worthy opportunities that address the challenges of poverty and sustainability. The TNP team led the research for this project and developed the resilience zone strategic planning framework and local area risk management concepts that were explored and further elaborated by the collaborators and participants in the Boston, San Diego and Toronto workshops.

In each city where we hosted a workshop, we benefited from local stakeholders committed to the concept of cross-sector convenings to define priorities for collaborative action on climate risks. We would not have been successful without their direct engagement in all aspects of the workshops’ design and conduct. We would also like to thank the many workshop speakers and participants who contributed their expertise, ideas and energy to this venture.

### **Cynthia McHale**

Director, Insurance Program, Ceres

### **Andrew Voysey & Nicolette Bartlett**

Development Director,  
Finance Sector & Senior Programme Manager,  
Climate Change, University of Cambridge  
Programme for Sustainability Leadership

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## ABOUT THE AUTHOR

**Jeb Brugmann** ([www.jebbrugmann.com](http://www.jebbrugmann.com)) is Managing Partner of The Next Practice Ltd (TNP) and a Senior Associate with the Cambridge Programme on Sustainability Leadership. His work over 25 years developing new urban sustainability practices and advising city leaders has spanned more than 30 countries. TNP team members involved in the initial research and development of concepts summarized in the paper include: Neluka Leanage, Michael Miloff, and Jeff O'Reilly, who together contributed to in-depth stakeholder interviews and conception of the Resilience Zone approach, and Brita Pagels who researched and prepared case studies. Invaluable comments and recommendations were provided throughout the workshop process by Cynthia McHale and Andrew Voysey to refine the framework and test its application in the workshops.

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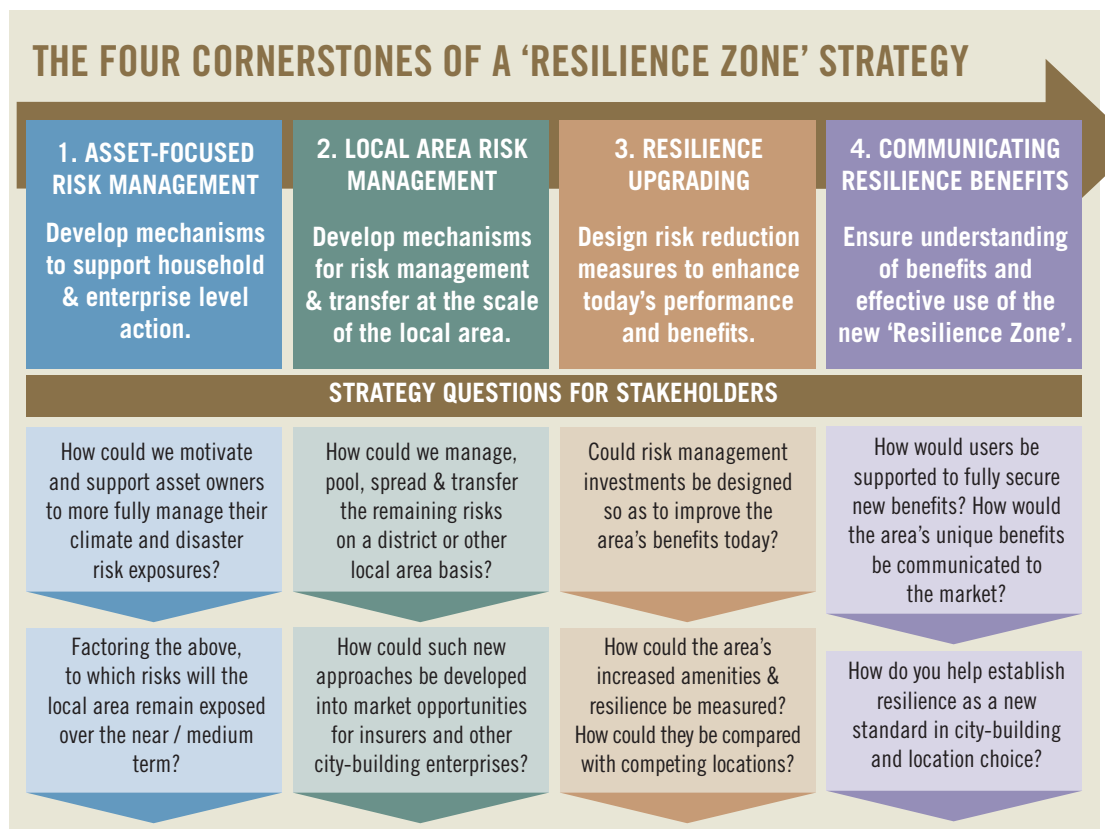
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# Abstract

Well-established practices in urban planning, redevelopment, and insurance can be adapted to stimulate investments in climate adaptation and natural disaster risk reduction.

It is from this perspective that Ceres, ClimateWise, CPSL, ICLEI and The Next Practice designed and delivered a workshop series in the US and Canada, bringing together insurance industry and city stakeholders in Boston, San Diego and Toronto. The aim of the series was to create a systematic understanding of where there could be mutually beneficial collaboration between these stakeholders to reduce the risks and increase the performance and value of today's climate-vulnerable local areas.

This paper presents a four-stage strategic planning framework tested and refined in these workshops along with the diverse ideas and innovations identified by workshop participants. The approach, summarized in the figure below, is proposed for use as a second stage of climate adaptation planning, following the completion of local vulnerability and risk assessments.



The framework focuses on the development of zones of highly resilient infrastructure, services, property performance, factoring each area's distinct functions, vulnerabilities and exposures, and its current (re)development priorities. In financial terms, the purpose of such a 'resilience zone' scheme is to create market conditions for reinvestment in areas that would otherwise be burdened by high risk management costs and disinvestment pressures. In some urban areas the opportunity may even exist to create a market premium on the values and rents of the location and its assets due to improved amenities and guarantees of uninterrupted function. Such a reinvestment dynamic can be supported through innovative application of the following familiar mechanisms and measures:

- ➔ Special planning overlays
- ➔ Performance-based economic instruments
- ➔ Special improvements tax assessments and value capture schemes
- ➔ Decentralization of public safety, emergency services, and risk management functions to district or precinct scales
- ➔ Special purpose vehicles for district-scale redevelopment
- ➔ Group captive insurance and other risk pooling and transfer schemes
- ➔ Benchmarking of locations and assets on the basis of 'resilience' as a defined category of rated performance
- ➔ Place-branding, marketing, public education and stakeholder engagement

The case for adapting these practices to transform areas of risk into preferred Resilience Zone locations is illustrated by the measures identified in the San Diego and Toronto workshops.

# Overview of the Challenge— and Opportunity

Catastrophic losses due to the increased incidence of extreme climatic trends and events are a reality in the world's most densely populated areas. Extreme rainfalls and winds, severe heat events, droughts, and wildfires, have increased in frequency, leading to annual fatalities and billions of dollars of property and business losses in the world's growing urban areas. Added to this, among the world's urban regions with populations of more than five million, nearly two-thirds are located in low elevation coastal zones. In these areas, sea-level rise and heightened storm surge risk may result in the eventual abandonment of some urban districts.

Increased climate risk is apparent across North America. According to Swiss Re, in 2012 74% of total global economic losses from weather-related events and 94% of global insured weather-related losses occurred in North America. Ninety-one per cent of US insured losses were associated with extreme weather events, including Hurricane Sandy and the harsh Midwestern drought.<sup>1</sup> The \$70 billion in Hurricane Sandy losses instigated the first serious government proposals to consider the actual abandonment of established coastal communities in New York City.

Insurance against catastrophic events, and other forms of risk transfer, are essential for the maintenance of urban business and property values, and for the financing of recoveries from extreme events. The unpredictability of extreme events and the extent of losses, however, is undermining the insurability of properties particularly in North American coastal areas.

Historically, the gap between privately insured losses and total economic losses from catastrophic events was largely covered by government insurance programs and special disaster relief appropriations. Losses from future events will place an ever greater burden on strained U.S. and Canadian public finances, particularly if they impact areas of high property and business value; specifically, in our cities. In such a situation, there are two likely ways forward. Urban areas can gamble on the risk of long-term disinvestment as their climate risks and vulnerabilities increase. Or they can innovate and pre-emptively invest in those at-risk areas to build their resilience to climate change, thereby also preserving or even increasing the insurability in these areas. The focus of this paper is to explore the *market-based* opportunity to build such urban resilience.<sup>2</sup>

Cities and their stakeholders, working together, have time and again demonstrated the ability to convert urban liabilities and emerging risks into new development opportunities. For example, successful brownfields redevelopment, downtown business revival, and transit-oriented development are investment-based responses to risks associated with past forms of development. These different redevelopment practices suggest that for cities, the problem of emerging climate change risk may also be approached as a reinvestment opportunity as much as a risk management imperative.

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1 SwissRe, *Sigma No. 2/2013 Natural catastrophes and man-made disasters in 2012: A year of extreme weather events in the US*, February 2013

2 The notion of resilience as an urban development opportunity was earlier introduced in: Jeb Brugmann, "Financing the Resilient City," *Environment and Urbanization*, Vol 24(1): 215–232, April 2012.

It is from this perspective that Ceres, ClimateWise, ICLEI and The Next Practice designed and delivered a workshop series in the US and Canada, bringing together insurance industry and city stakeholders in Boston, San Diego and Toronto. The aim of the series was to create a systematic understanding of where there could be mutually beneficial collaboration between these stakeholders to reduce the risks and increase the performance and value of today's climate-vulnerable local areas.

The following paper introduces the workshop's main strategic planning concept: **the Resilience Zone**. A Resilience Zone is a special improvement district, precinct, neighbourhood, or corridor designated in official planning documents for comprehensive risk management and upgrading so that it performs with resilience in the face of a variety of predictable and unpredictable extremes. 'Resilience' is itself proposed here as a new category of urban property performance.

***Resilience is the ability of a property and its surrounding urban area to provide predictable, targeted benefits to tenants, residents and users, and predictable returns to owners and investors, under a wider range of often unpredictable circumstances.***

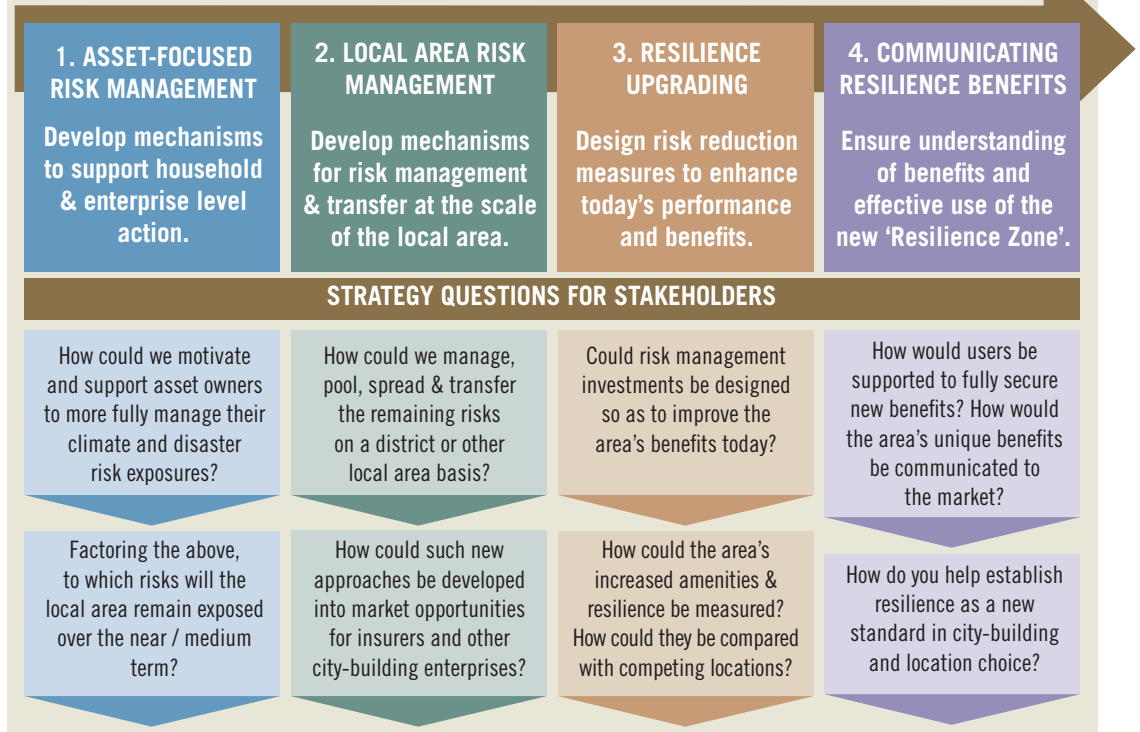
In this sense, an area or zone that is purposefully managed and upgraded to have increased resilience, relative to competing areas, should become a preferred location of choice. On this basis, it might also attract increased economic activity, and secure increased rents, asset values and returns on investment.

The Resilience Zone approach, summarized in **Figure 1** (page 9), involves four cornerstones of strategic planning and action to create a market foundation for climate adaptation. The first two cornerstones strengthen risk management and maintained insurability. The subsequent two cornerstones strengthen an area's ability to attract investment, and to communicate resilience benefits as a way to maintain and even increase value in the Resilient Zone.

Each of the above cornerstones of action are further elaborated in section C below, and illustrated by measures identified by stakeholders in the San Diego and Toronto workshops.



## FIGURE 1. ESTABLISHING THE CORNERSTONES FOR MARKET-BASED REDEVELOPMENT OF 'RESILIENCE ZONES'



**1. Asset-focused Risk Management.** In the first instance, local stakeholders and their partners in government, insurance, utilities, and other relevant industry sectors work to distinguish which risks can be best addressed at the scale of individual properties and enterprises. They identify measures in policy, planning, taxation, building standards, development approvals, insurance, property and business finance, and education and communications to support asset owners to manage and/or transfer those key risks. This exercise results in the identification of those critical risks to which the local area will remain exposed even if measures at the scale of individual properties are successful.

**2. Local Area Risk Management.** Risk management in urban areas is typically confined to individual properties and assets, single enterprises and organizations. But many risk exposures exist at the scale of districts, precincts, neighbourhoods, or corridors. Local climate adaptation planning across North American cities has identified risks and vulnerabilities—flooding, wildfire, severe heat, power loss, extreme winds—arising from the unique design, age and demographics, and the unique mix of activities in each *local area*. Even if property owners, residents, and businesses manage their business and property risks effectively, they will likely still be exposed systemically to the risks confronting the area in which they are located. They may not be able, on an individual property or business basis, to bear the costs of insuring against risks at this scale. For this reason, property owners and stakeholders in climate vulnerable zones must establish mechanisms for collaborative management of risks that are unique to the area, protecting the area's performance as a business, service, and/or residential location. One mechanism may be the establishment of a body or institution that is specifically responsible for management of risks confronting the local area. This entity may even engage with the insurance industry, representing an insurance pool, to develop customized risk transfer solutions for its unique exposures.

- 3. Resilience Upgrading.** Improved risk management and transfer can support renewed investment in an area. Investments can be designed with both risk reduction and immediate local performance improvements in mind, reinforcing insurability while also improving the attractiveness of locating and residing in the area. For instance, ‘greenscaping’ major road arterials by creating attractively landscaped medians and roadsides is increasingly used in United States cities to reduce storm water runoff and the associated prospect of flooding. At a much larger scale, the city of Curitiba, Brazil dramatically reduced major flooding crises in the multiple river flood plains of the city through voluntary land swaps with private owners followed by the development of an extensive system of river side parks, cycling trails, catchment ponds, and sports fields. Increased amenities, facilities, and local service improvements can create value. The availability of green space has made Curitiba one of the most livable and attractive residential and business locations in the continent. In other words, with the aid of creative design and business innovation, ‘adaptation’ may potentially be pursued as a redevelopment investment opportunity that offers financial returns, not just as a cost. Investments that produce local resilience may even generate a performance premium for property developers, owners, tenants, and public entities in the form of increased property values, rental, tax, and service revenues.
- 4. Communicating Resilience Benefits.** Once an area’s risks are reduced and transferred, and the additional performance benefits of the Resilience Zone are under development, the advantages of the local area may be documented and communicated to create market demand, increasing the potential for a ‘resilience premium.’

# A City-Builders' Approach to the Resilience Challenge

The above framework has been conceived as a guide for the development of implementation programs following initial local climate adaptation planning (i.e., vulnerability and risk analyses). Approaches to climate adaptation planning are increasingly well-established, and are being diffused city-to-city across the continent and internationally. Cities like Chicago and New York have partnered with leading climate scientists, insurance companies, consultancies, and engineering firms to create detailed models and scenarios of emerging climate risks on a block-by-block basis and across urban service functions. As the case study (**Case Study A**, page 15) exemplifies, current implementation of these adaptation plans has tended to be first pursued through departmental and service/utility enterprise risk management efforts. However, as illustrated by the clear exposures in New York City—in spite of its highly advanced adaptation planning efforts—such expert analysis and planning does not seem to provide a sufficient catalyst for pre-emptive expenditures by property owners or whole communities on risk reduction and/or resilience-building. The current method of adaptation planning and strategy is not establishing the market conditions for upgrading climate vulnerable local areas. Climate risks and responses have been pursued as a distinct and even esoteric agenda, requiring special public sector funding, without sufficient integration with local economic development strategy and urban redevelopment planning.

The Resilience Zone approach focuses implementation efforts in two ways that are complementary, albeit distinct from most current approaches to climate adaptation planning.

**First**, the Resilience Zone approach focuses on the comprehensive management and upgrading of at-risk districts, neighbourhoods, and corridors. It is these complex working units of urban regions, shaped by built form, infrastructure and service systems, and commercial and social activity patterns, that produce unique vulnerabilities and systemic risks. The measures required to both reduce risks and to increase the reliability of an area's primary functions will be distinct to each local area. Each area will have unique opportunities and constraints for innovation in infrastructure, utilities, amenities and services. The formal designation of the Resilience Zone as a special planning area, establishes resilience as a priority performance aspect of the area's existing functions.

**Second**, the Resilience Zone approach focuses on reinvestment to boost current functions, amenities, and economic attractiveness while addressing emerging climate vulnerabilities and risks. It seeks to avoid the treatment of climate adaptation as an end in itself and thereby as a cost to society with no financial return. Design for resilience is approached as a performance objective in mainstream re-development so as to increase the quality and differentiation of the investment project.

This bias towards comprehensive, district-scale reinvestment, using design, technology, and regulatory innovation to unlock new value in urban assets, draws upon lessons from successful urban re-development and local economic development practices.

Problems of extreme risk are not at all new to North American cities and counties. In the 1980s, for instance, North American cities and regions confronted inventories of risk and liability, accumulated through their industrial heydays, in the form of thousands of contaminated ‘brownfield’ sites. By 2004, the US GAO estimated that there were 450,000 to 1,000,000 brownfield sites in the U.S.<sup>3</sup>

Cities from the Great Lakes region to Los Angeles, from Seattle to Halifax, had to choose between either innovation to convert this inventory of place-based liability into premium properties and public amenities, or the long decline of thousands of urban districts.

An unexpected process of public and private reinvestment in contaminated core city districts was enabled by three key factors:

- New forums for collaboration were created across the value chain of city-building—between governments, banks, insurers, utilities, developers, and local resident communities—to share, manage, and transfer the risks and liabilities together.
- New innovations in urban finance, policy, planning, engineering, insurance, communications, and institutions—arising from such collaboration—were piloted and then scaled to remediate contamination and mobilize investment in the vacant sites.
- Cities and city-builders shared successful practices across the continent, resulting in a repositioning of brownfield sites in the minds of investors, developers, and residents from places of risk to places of revitalization opportunity.

Scores of cities in the U.S. and Canada established brownfield redevelopment partnerships to create the market conditions for remediation and public-private reinvestment. Government programs subsidized initial assessments and site remediation. Insurers created a whole new category of insurance products, including cleanup cost cap insurance, pollution-in-place insurance, and post-remediation pollution liability insurance. The widespread adoption of tax increment financing in U.S. cities was directly related to brownfields strategies, and reflected confidence in the potential of increased property values in these high risk areas once they were decontaminated. Law reforms were enacted to limit lender liability, and to allocate and set time limits on civil liability. To overcome private developer concerns about higher financing costs, project delays, and sustained post-remediation liabilities on brownfield projects, local governments provided a menu of incentives and supportive measures. These included certificates of compliance, tax abatements, and grants or revolving loans. Supporting all these reforms and mechanisms, a new community of development practice needed to be established. Collaborative state and nationwide programs along with international conferences and associations created standards of brownfields development practice, training courses, and land qualification and professional compliance services.<sup>4</sup> In short, an entire, *new market ecosystem* was established to enable a performance-based, value creation approach to a problem of once intractable risk, cost and liability.

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<sup>3</sup> United States GAO, *Report to the Congressional Requesters: Brownfield Redevelopment* (GAO - 05-94). USGAO, December 2004.

<sup>4</sup> For an excellent documentation of the many market failures that needed to be overcome to establish functioning markets for brownfields redevelopment, see Dan Hara, *Market Failures and The Optimal Use of Brownfield Redevelopment Policy Instruments*. National Round Table on the Environment and the Economy, January 2003.

The success of this approach can be measured in the price appreciation of these once vacated areas, and of surrounding properties and neighborhoods.<sup>5</sup> The largest and most recent study of the impact of brownfields remediation on adjacent housing prices found a statistically significant increase in values of adjacent properties within a one kilometer radius—even prior to their full redevelopment.<sup>6</sup> When we consider the worst case scenarios for climate change and its impacts on North American cities, we will be well-served to remember the not-too-distant years of disinvestment, litigation, regulation, and idle core city brownfields inventory.

Evidence suggests that other place-based strategies for addressing other forms of urban property and infrastructure risk are having similar positive market impacts (see page 14, **Table 1**). Taking lessons from approaches that focus on revitalizing challenged urban areas while also addressing their unique vulnerabilities—Empowerment Zones, Redevelopment Zones, Business Improvement Areas, and Business Revitalization Zones, Recycling Market Development Zones, Community Improvement Districts, to name a few—the designation of a Resilience Zone can begin the process of organizing stakeholders to evaluate an area’s broad resilience requirements and opportunities.

What is unique to the approaches summarized above is their focus on *creating a market foundation* for re-investment. Establishing market conditions to convert risks and liabilities into investment opportunities and returns requires collaborative, mutually supportive efforts across the entire system of urban planning, development, and management. Stand alone or siloed approaches generally fail to establish a market dynamic attracting sufficient investment resources and business innovation to effectively address the challenge. As illustrated by the case of brownfields regeneration—or the more recent emergence of ‘green’ building and eco-districts as a new category of urban asset performance—a key requirement for success is the coordinated establishment of market incentives and the elimination of market barriers. Concerted stakeholder collaboration is required to bridge the gap between a growing inventory of design and technology solutions to address urban risks and the establishment of a market dynamic to support their mainstream application. Public sector planning, standards, legal reforms and fiscal incentives need to be co-developed with innovations in design, technology, development finance, infrastructure and insurance to create these market conditions. Short of doing so, the challenge of climate adaptation will remain a cost to be borne by government, property owners, and businesses—or avoided until the inevitable extreme event.

Measures and investments to both reduce risks and increase the reliability of the area’s primary functions and advantages will be distinct to each area. Each area is confronted by a unique mix of risks and vulnerabilities. Each area has unique opportunities for better and more reliable infrastructure, utilities, amenities and services related to its unique and evolving functions, i.e., as a residential, commercial, cultural, or research district etc. The formal designation of a Resilience Zone as a special planning area, establishes the improvement *and resilience* of these functions as central planning and development objectives. It addresses the area’s climate-related risks and vulnerabilities as a further reinforcement of the established development priorities of those currently living, working, and investing in the area.

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5 See for instance Nancey Green Leigh and Sarah L. Coffin, “Modeling the Relationship among Brownfields, Property Values, and Community Revitalization,” *Housing Policy Debate*. 16, no. 2(2005), 257-280. See: [http://harriscocommercialap-praiser.com/files/hpd\\_1602\\_leigh.pdf](http://harriscocommercialap-praiser.com/files/hpd_1602_leigh.pdf) (Accessed February 2013)

6 A 2012 study by the Duke University Nicholas Institute for Environmental Policy Solutions considered impacts of brownfields remediation on housing prices within one kilometre of a brownfield site. The sample was drawn from the 1,178 properties participating in the US EPA Brownfields Program, and was of sites with completed remediation by 2009 for which there is an available record of housing transactions within a five kilometre radius (n = 110). The authors conclude that “...averaging over the experiences at a large number of brownfields, cleanup leads to housing price increases [in adjacent properties—author’s note] between 5.1% and 12.8%. Moreover, the latter number is consistent with a willingness to pay (i.e., welfare) interpretation, not simply a capitalization effect. Taking the most conservative estimate of the value of an average site cleanup, we find that it indeed passes benefit-cost analysis by an order of magnitude.” Kevin Haninger et al (2012). “Estimating the Impacts of Brownfield Remediation on Housing Property Values”, Duke Environmental Economics Working Paper Series, Working Paper EE 12-08. Chapel Hill: Duke University. <http://sites.nicholasinstitute.duke.edu/environmentaleconomics/files/2013/01/WP-EE-12-08.pdf> (Accessed February 2013)

**Table 1: Coordinated Risk Management + Performance Enhancement = Market Value**

AREA OF DEVELOPMENT COLLABORATION	EMERGING RISKS	REQUIREMENT FOR PERFORMANCE PREMIUM	EXAMPLE	MARKET IMPACT
<b>Downtown Revival</b>	Loss of anchor retail & commercial tenants begins cycle of vacancy, property deterioration, asset depreciation, crime.	Establishment of signature cultural, retail, recreational destinations with residential & commercial offerings & associated 'activation'.	Following loss of their historic commercial-retail functions, declined downtowns across N. America have been successfully redeveloped as destination cultural, historic, sports and festival districts.	Not without controversy from a public finance and gentrification perspective, nonetheless, studies of revitalization via destination facilities indicate substantial increases in property values, occupancy, and retail activity. A stadium in downtown Columbus, OH increased district businesses by 50%, employment by 191%, property use by 71%, and appraised values by 267%. <sup>7</sup>
<b>Transit Oriented Development (TOD)</b>	Traffic congestion associated with auto dependent planning & design has increased public & private costs, & accident risks, & has reduced employee & business productivity.	Multi-modal mobility hubs provide choices to users to optimize their trips, and support the success of intensified mixed use residential, retail & commercial precincts.	A study of TOD strategies along new Phoenix light rail lines itemizes 16 ways that they decrease costs and 11 ways they increase revenues for developers and owners. <sup>8</sup>	Studies of properties located in TOD hubs in San Diego, St Louis & Santa Clara, CA indicates a residential property premium of 2-18%, 32%, and 45% respectively. Commercial-retail premiums were as high as 167% in San Diego and 120% in Santa Clara. <sup>9</sup>
<b>Green Building &amp; Urban Services Optimization</b>	Urban growth and the resource intensity of infrastructure & buildings has increased the risk of power disruptions and water shortages, and associated increases in operating costs.	Buildings and districts designed for optimal human productivity and natural resource efficiency, with associated reductions in operating costs.	Green Buildings in San Diego have had a vacancy rate 4% lower than for non-green properties and LEED-certified buildings command the highest rents. <sup>10</sup>	A McGraw Hill survey of green building owners indicated a 10.9% premium in property values, a 9.9% ROI premium on new buildings and 19.2% ROI premium on retrofitted buildings. <sup>11</sup>

7 John Glen School of Public Affairs, Ohio State University, *Major Findings of the Assessments of the Gross Impacts of the NHL Columbus Blue Jackets, Nationwide Arena, and the Arena District on Greater Columbus, 1998-2008*, July 2008

8 Strategic Economics, *Impact of TOD and Smart Growth Incentives on Development in Phoenix*, March 17, 2009, US EPA/LISC/Sonoran Institute. <http://www.epa.gov/dced/pdf/phenix-sgia-impact-tod.pdf> ( Accessed February 2013)

9 Nadine Fogerty et al, *Capturing the Value of Transit, Center for Transit Oriented Development*, 2008. <http://www.reconnectingamerica.org/assets/Uploads/ctodvalcapture110508v2.pdf> (Accessed February 2013)

10 CBRE Global Research and Consulting, *Global Market View - Q2 2012*, 2012. <http://www.cbre.com/AssetLibrary/Global-MV-2Q12.pdf> (September 2012). Also: The US Green Building Council, *The Business Case for Green Building*, July 2012.

11 McGraw Hill Construction, *Green Outlook 2011: Green Trends Driving Growth*, 2010.

## CASE STUDY A. ESTABLISHING A NEW LOCAL RISK MANAGEMENT AGENDA IN THE CITY OF CHICAGO

In late 2006, Mayor Richard M. Daley convened the Chicago Climate Task Force (Task Force) to oversee the development of the Chicago Climate Action Plan (CCAP). The Task Force represented the City, sister agencies, the philanthropic community, non-profits, the Illinois state government, the Federal government, academia, unions, and businesses. Mayor Daley then appointed 14 private sector and philanthropic leaders to a Green Ribbon Committee to maintain the momentum generated in the creation of the plan and offer ways to hold the Plan accountable for its established goals.

The CCAP was grounded in a number of commissioned scientific studies. Oliver Wyman, a global management-consulting firm, used the results from the scientific studies to prepare an assessment of economic impacts on City assets (i.e., infrastructure, services). The assessment addressed five primary considerations: areas that would be most affected from a financial perspective, primary impact drivers (e.g., heat, precipitation), nature of the impact (e.g., deterioration of building facades), type of financial impact (e.g., operational cost), and magnitude of potential impacts. All city departments, agencies, and authorities and hundreds of other stakeholders were involved in developing strategies to respond to the findings. The plan was released to the public on September 19, 2008. By July 2009, the research and planning process had leveraged nearly \$3 million of philanthropic support and pro-bono services.

Oliver Wyman worked with staff from 18 City departments to determine how i) increased average precipitation, ii) increased average temperature, iii) increased extreme heat days, iv) increased extreme rainfall, and v) shoreline change would impact each departments' operations, assets, personnel and services. Oliver Wyman ran simulations of impacts upon departmental costs and revenues between 2010 and 2099. The conservative estimated cost to the City of Chicago ranged from \$690 million under a low- greenhouse gas emissions scenario to \$2.54 billion under a high-greenhouse gas emissions scenario. These projections did not account for damage to non-municipal assets.

Based on the scientific studies and Oliver Wyman assessments, Montgomery Watson Harza (MWH), an engineering consulting firm, helped the City departments further clarify risks and categorize actions as "must do-early", "must do", investigate further", and "watch". Departments used this information to craft individual work plans.

The results from the MWH exercise were used to develop work plans for 22 departments containing over 500 milestones. AT Kearney led a process with City managers to identify implementation milestones for departments. Staff from each department now convene monthly to report progress and collectively work through implementation challenges.

The City is now (2013) institutionalizing climate risk into each departments' operations, asset management, and policies, as well as collaborating with external stakeholders to develop programs that are co-beneficial. In addition to continuing impact assessments and planning studies, some initial climate change adaptation projects include:

- Chicago Green Roof Initiative, reducing storm water runoff and decreasing the heat island effect.
- Green Alley Program, which reduces flooding by managing stormwater onsite using custom permeable paving and also costs less than conventional pavement.
- Publicly available GIS-based data regarding heat islands and GIS data pertaining to storm water management.
- Creation of the Chicago Infrastructure Trust, a Mayor Emanuel-led effort to leverage private investment to update Chicago's infrastructure.

### Conclusion

Persistence and continuous executive leadership are essential to planning for these challenges and seeing the process through from planning to investment. Seven years after beginning the well resourced, informed, focused, and well staffed climate change adaptation planning process, the City and external stakeholders are transitioning from planning to implementation and from focusing solely on climate to incorporating climate risk into a larger sustainability framework. The time required for this process through public sector initiative alone highlights the importance of establishing market-based incentives and responses to accelerate and broaden solutions to the climate risk problem.

# Kick-Starting the Resilient City

In 2012, Ceres, ClimateWise and the University of Cambridge Programme for Sustainability Leadership (CPSL) conducted a pilot workshop in Boston to test the feasibility and value of collaboration between insurers, city planners and major property owners and developers to pursue resiliency as a form of urban performance. Taking lessons from that workshop, in early 2013 The Next Practice developed the four cornerstone Resilience Zone framework as a way to organize more in-depth exploratory discussions between stakeholders. Ceres, ClimateWise, CPSL, ICLEI and The Next Practice then developed a workshop process for introducing local stakeholders to the four cornerstone approach. The subsequent workshops in San Diego and Toronto involved senior managers and professionals from local and regional government, port and conservation authorities, utility companies, the property industry, insurers and re-insurers, community foundations and other civic organizations. These stakeholders first reviewed the main climate-related vulnerabilities and risks confronting different types of areas in their cities, which had been scientifically identified during their adaptation planning processes. Then the stakeholders used the four cornerstone framework to identify a mix of measures and innovations that might, when applied systematically together, kick-start pro-active resilience upgrading of each type of at-risk area. The four cornerstone approach was further refined following each workshop.

In San Diego, working groups focused on their region's unique risks and vulnerabilities:

- ➔ in coastal areas (i.e., flooding and sea level rise),
- ➔ inland mountain suburbs (i.e., wildfires), and
- ➔ to lower income areas (i.e., extreme heat events).

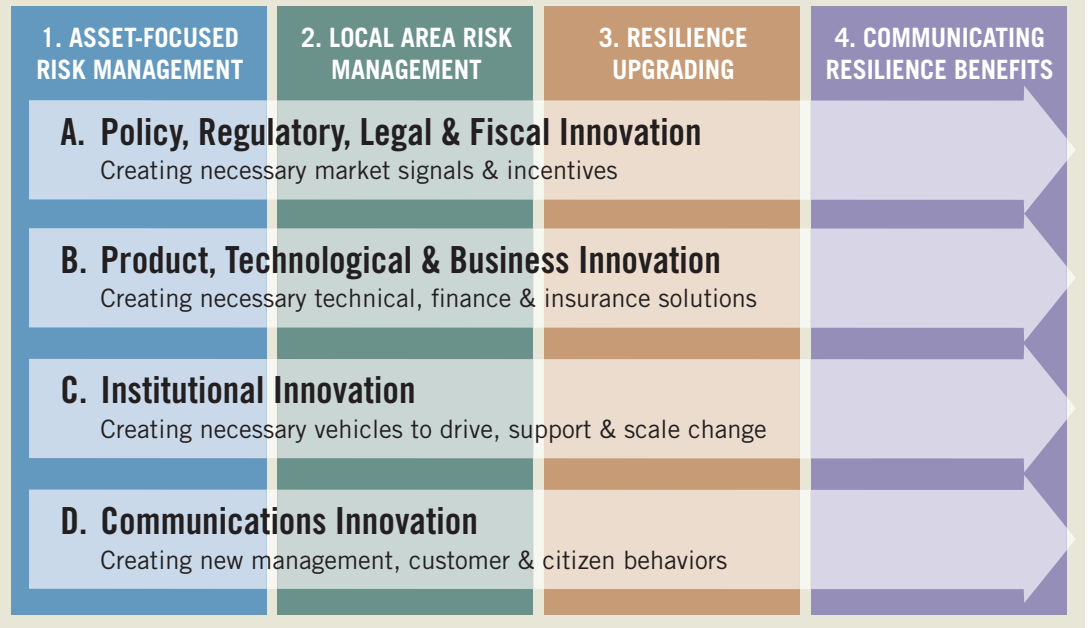
In Toronto the working groups focused on areas vulnerable in different ways to extreme rainfalls and flooding, and to extreme heat events:

- ➔ both lower income and higher income high-rise areas,
- ➔ middle income low density residential areas, and
- ➔ high density commercial areas.

Across the four cornerstones of action, four areas of innovation were considered, as illustrated in **Figure 2**, (page 17).



**FIGURE 2. DEVELOPING THE MARKET ECOSYSTEM FOR RESILIENCE UPGRADING**



The rationale for focusing on these four areas of innovation can be further illustrated by considering one of the most successful, historical movements in urban risk management.

In the 19th and early 20th centuries, urban fires caused major social and economic peril. The risk of catastrophic fire increased with rapid urban growth and industrialization; the co-location of industrial facilities containing fuels, furnaces, boilers, and chemicals within residential and commercial communities; poor building standards and wide use of flammable materials; as well as underdeveloped fire suppression technologies and emergency services. Major fires destroyed large swaths of Atlanta, Baltimore, Boston, Chicago, New York, San Francisco and Seattle; Montreal, Toronto, St. Johns, Vancouver and Windsor. Much as with the brownfields regeneration and local climate adaptation planning movements of recent decades, North American urban leaders and managers joined forces in an international fire safety movement that established an entire market ecosystem for fire prevention and management, spanning four key areas of asset-based risk management, as follows:<sup>12</sup>

**Policy & planning innovation.** Urban planning and building codes were introduced and/or adapted to reduce the location of industrial hazards near residential/commercial areas, and to prevent loss of life and the spread of fires within and between buildings.

**Business innovation.** A whole new range of fire resistant building materials was developed. There was constant innovation in fire extinguishers and other fire suppression systems and related business models; the first automatic electric fire alarm was invented in the U.S. in 1890.

**Institutional innovation.** The National Fire Protection Association (U.S.) was established by the insurance industry in 1896 to standardize the growing market for fire sprinkler systems. Subsequently, with other industries and fire departments joining NFPA, the organization developed more than 300 national building and fire safety standards for usage by local governments. This was accompanied by the development of the first technical institutes

<sup>12</sup> William M. Shields, Ph.D, Urban Conflagrations in the United States <http://www.hss.energy.gov/nuclearsafety/nfsp/fire/workshop2010/shields/conflagrations.pdf> (Accessed June 2013). Also see Pete Thomas, History, Tipping Points and Unexpected Consequences: Learning From the Past – Thinking About the Future, unpublished presentation at the NCSE Seminar in January 2013.

specializing in fire protection. The first degree program in fire protection engineering was established at the Armour Institute of Technology in 1903.

**Communications innovation.** Property developers, owners, and the public also had to be trained to work with fire departments, comply with new codes, and adopt fire prevention and emergency response behaviours. National fire prevention days were established in Canada and the U.S. in the early 20th century. Fire safety education programs were established by fire departments, targeting different demographics. By 1890, telegraph-based neighbourhood fire alarm boxes and central dispatching systems had been installed throughout more than 500 U.S. cities.

Taken together, these coordinated planning, technology, business, institutional, and communications responses all but eliminated the threat of city-destroying fires that had plagued the continent since earliest colonial times.

Applying a similar strategic logic, participants in the Building Resilient Communities workshops put the framework outlined in Figure 2 to the test. The initial ideas generated are summarized below. The workshop participants' ideas about possible measures and innovations for developing a local market dynamic to support resilience upgrading are aggregated in the associated tables.

# Building a Market Foundation for Resilience

## Cornerstone #1

## ASSET-FOCUSED RISK MANAGEMENT

*How do we motivate and support property owners, infrastructure providers and local businesses to manage climate risks on their own?*

A logical place to start a resilience-building process is with current practices in risk management. Today's practices focus primarily on risk reduction through the design, maintenance, and management of individual assets—buildings, properties, equipment, and enterprises. Consistent with the overall Resilience Zone framework, workshop participants considered the following four areas of innovation to adapt these practices to address climate change risks:

- ➔ Preventative risk reduction through government planning and development control
- ➔ Preventative risk reduction through product re-design and standards. Transfer of risk through innovations in property, casualty and business insurance.
- ➔ New risk management routines within key urban management and service institutions, applying institutionalized national standards
- ➔ Increased and improved communication and education about risks and their management within businesses and households

The aim was to identify measures that, taken together, could establish market dynamics that better factor climate-related risks into the risk management of individual assets and businesses. Among the diverse reforms and innovations identified by the San Diego and Toronto workshops, the following measures suggest a strategy for building greater resiliency at the asset scale (see **Table 2**, page 21).

## REMAINING RISKS

The identification of these kinds of measures allows stakeholders to determine the extent to which current practices can be improved to reduce climate risks and vulnerabilities. Conversely, the same exercise helps stakeholders to determine what specific risks and vulnerabilities will be remaining, even if current practices are improved. Participants in the Building Resilient Cities workshops answered the question: to which risks would each vulnerable local area still remain exposed over the near/medium term, factoring the likeliness and timeliness of identified actions by asset owners? On this basis, requirements for innovation and collaboration at the scale of the entire local area could be identified.

Research undertaken for this paper highlighted the extent to which traditional practices in asset- and business-based risk management would not likely address emerging climate risks. Prior to the San Diego and Toronto workshops, in-depth interviews were undertaken with senior executives and chief risk officers (CROs) from the full spectrum of institutions and businesses involved in developing, servicing and managing urban areas and assets. Executives in local government, commercial and residential property development, property development finance, utilities, infrastructure providers, insurers and re-insurers, property owners, and property management companies were interviewed. The primary focus of the interviews was to understand which risks are given priority attention in their organizations, so as to ensure achievement of their primary objectives. In short, they were asked to identify:

- i) the top three or four business or asset risks that they actively manage as priorities;
- ii) the time frame over which they monitored and managed these priority risks;
- iii) their primary strategies and practices for managing priority risks;
- iv) and the extent to which business practices were being changed to respond to climate change risks

So as not to bias the responses, the interviewers informed the respondents that they were interested in understanding the full picture of business risk management in their sector; they did not inform the respondents that they were primarily interested in climate risks. In summary, the research findings indicated that:

- ➔ Climate-related risks and climate change were not identified as one of the priority business risks by the senior executives in any sector or industry. The only exception was in the re-insurance industry where, among a variety of financial and regulatory risks, the monitoring and mitigation of systematic risks was identified as a priority. (Systematic risks are large scale exposures such as epidemics, wars, or discoveries (e.g., asbestos toxicity) that cannot be easily diversified.)
- ➔ The mean time frame for monitoring and managing an identified priority business risk among the industries and sectors is three (3) years (insurers and re-insurers excluded). The average time horizon for management of a priority business risk was 3.8 years.
- ➔ Only the following kinds of enterprises indicated a top priority business risk that had any *direct* relationship to extreme climate events: i) utilities (stability of power supply), ii) property owners (physical risk to asset) and iii) property insurers and re-insurers.

In other words, market and political conditions are not requiring the allocation of resources to climate risk management. Business and asset risks beyond a 3-4 year time horizon, or whose probabilities are otherwise uncertain, or which are not required to be managed by law are generally left unmanaged and underinsured. Business executives and CROs in some sectors are changing asset-focused risk management practices to address recurring problems of extreme weather in certain areas, such as in flood prone areas. However, they are not changing asset-focused risk management practices to address emerging climate risks, because neither their license to operate, market signals, nor market opportunities provide a business rationale for confronting these less familiar and generally medium-term risks.

These findings give impetus to the development of new incentive systems for asset-based risk management. The ideas of the San Diego and Toronto workshop participants are summarized in **Table 2**. However, the participants also identified a wide range of climate-related risk exposures that would remain, even after their proposed asset-focused measures were adopted. This conclusion highlighted the need to explore the other cornerstones of the Resilience Zone approach, in particular Local Area Risk Management and Resilience Upgrading.

**Table 2. Selected Measures to Adapt Current Risk Management Practices to Reduce Climate Risk**

**CORNERSTONE #1: ASSET FOCUSED RISK MANAGEMENT**

(Example of measures for: extreme heat, flooding, wildfire, sea level rise)

<p><b>Policy, Regulatory, Legal &amp; Fiscal Innovation</b></p>	<ul style="list-style-type: none"> <li>• Adopt building codes to reduce heat island effects and fire risks, including wildfire risks (e.g., hardening of homes, reduce distance between homes and wildlands, increased brush clearance).</li> <li>• Adapt the coverage of local improvements ordinances (typically for street, sidewalks, drain improvements etc.) to include climate-related risk reduction measures.</li> <li>• Require additional risk assessment in development proposals.</li> <li>• Provide an approvals fast-track for property improvements and development applications that substantially reduce prioritized risks.</li> <li>• Require insulation upgrade on transfer of property title.</li> <li>• Reform the power utility rate setting process to allow for valuation of power redundancy/reliability.</li> <li>• Fund emergency response, hazard management planning.</li> </ul>
<p><b>Product, Technological &amp; Business Innovation</b></p>	<ul style="list-style-type: none"> <li>• Adapt the property-assessed clean energy (PACE) financing mechanism to the financing of backup power, improved HVAC, and backwater valves.</li> <li>• Supplement post-incident insurance payouts with grants/loans/incentives to rebuild in a resilient way and to latest code levels.</li> <li>• Insurers and mortgage companies to reward high resiliency audit ratings through rates/pricing.</li> <li>• Organize service providers to offer resiliency audits and upgrades during policy renewals, mortgage refinancing, property sales.</li> <li>• Build resilience characteristics more explicitly into insurance underwriting criteria, coupled with feedback to clients.</li> </ul>
<p><b>Institutional Innovation</b></p>	<ul style="list-style-type: none"> <li>• Work with national Green Building Councils to establish a resiliency rating system to be used in residential and commercial building audits.</li> </ul>
<p><b>Communications Innovation</b></p>	<ul style="list-style-type: none"> <li>• Establish emergency and social services protocols to communicate brownout risks and responses to vulnerable populations.</li> <li>• Increase collaboration between public agencies and insurers to message risks to the businesses, residents and property owners.</li> <li>• More effectively communicate risks and risk reduction behaviors to the community by tying messages to recent, observed events.</li> </ul>

***What mechanisms and measures can be designed to more economically manage, pool, spread, and transfer climate change risks at the scale of the local area?***

A large portion of climate and other natural disaster risk exposure in urban areas is determined at the scale of the city's unique districts, precincts, neighbourhoods, corridors, and infrastructure subsystems. These diverse local areas are the working units of the city, each confronted by unique vulnerabilities associated with the design, age, demographics, and unique mix of activities in that location. Individual property owners, residents, and businesses may not be able to manage or bear the costs of insuring risks that are determined at the local area scale, and not on an individual property or business basis.

Even if property owners and businesses manage their own risks, they are still systemically exposed to the risks of the whole area. This was demonstrated in New York City in the case of Hurricane Sandy. For example, a business might protect its building from flood, but the streets used to access the building may not be so protected. A building may have back-up power generators, but broader sub-grid problems can still blackout the district. A tragedy of the commons dynamic typically occurs. Costly, shared risks, to which all located in an area are exposed, remain less monitored and insufficiently managed.

In conventional practice, some risk management already takes place at the scale of whole areas. For instance, police and emergency services are often organized at a district scale to reflect unique vulnerabilities in different communities. Special authorities may exist to manage watersheds and their flood plains, coastal areas, or special economic districts such as ports. To respond more effectively to known disaster risk exposures, some cities such as Kobe, Japan's decentralized reconstruction planning to fully involve citizens, property owners, and stakeholders within designated zones, e.g., Kobe's machizukuri planning committees.<sup>13</sup> Such approaches have instigated ongoing changes in the approach to disaster risk management. Not surprisingly, New York City has initiated a place-based 'Community Reconstruction Zone' approach to post-disaster redevelopment of areas most impacted by Hurricane Sandy, involving intensive collaboration between local stakeholders at the scale of each priority vulnerable area.

## RISK ZONES

The Kobe and New York examples highlight the need to establish more proactive pre-disaster risk management capacity at the local area scale. Such a focus on local area management was a major recommendation of one of the largest, internationally financed climate adaptation projects, in Ho Chi Minh City, Vietnam. The project's international team of planners and technicians concluded that effective adaptation will require the spatial definition of 'urban structure typologies' in the city. By structure typologies, the planners mean similar types of urban areas, identifiable across a metropolis, that share similar forms of buildings, infrastructure, street networks, economic activities, environmental risks and demographic vulnerabilities. Increasing the resilience

13 David W. Edgington (2010). *Reconstructing Kobe: The Geography of Crisis and Opportunity*. Vancouver: University of British Columbia Press, pp. 127-129.

of each typology would involve a distinct mix of adaptation and disaster risk management measures. The Ho Chi Minh project planners call the process of developing portfolios of adaptation and risk reduction measures for different local structural typologies ‘downscaling’.<sup>14</sup>

The Resilience Zone approach proposes the initiation of this kind of ‘downscaled’ planning, design and risk management for preventative purposes, focusing specifically on the risks that remain after asset-focused risk management is enhanced (see above).

The identification of distinct zones for local area risk management follows from the mapping of distinct vulnerabilities and risk exposures to common types of areas—to typical residential neighborhoods, mixed use precincts, retail-commercial corridors, for instance. Once the most logical, priority zones are identified, the process can commence to establish special planning areas or overlays for each typology. These planning overlays would be recognized in official planning and zoning documents in order to formalize the unique resilience-building priorities for each type of area.

Existing local institutional arrangements for decentralized area planning and governance (e.g., neighborhood councils, business improvement areas) would also be taken into consideration. An existing mechanism can be adapted to assume greater risk management responsibilities, such as the ward councils that were adapted in Kobe. Alternatively, a new and distinct local entity or disaster risk management unit can be established to engage local stakeholders, coordinate the collection of data, and to monitor, plan, and lead the implementation of loss prevention efforts. This mechanism could be funded through a special property or utilities assessment to support a customized risk management program for the area. It could also engage with the insurance industry to explore options for transfer of risk that cannot be managed locally. The result would be a set of locally responsive resilience measures for each designated area.

## APPLYING ENTERPRISE RISK MANAGEMENT CONCEPTS TO LOCAL AREA PLANNING

However, creating a stand-alone, separate mandate and capacity for climate risk management assumes that local stakeholders will allocate distinct time and resources to proactive management of emerging climate risks. This may not be the best way to establish a comprehensive and sustained effort. Preventative collaboration and investment may require that climate risk reduction and resilience-building are integrated into the more mainstream, and ultimately ‘everyday,’ development agenda for that area, considering all types of risk and opportunity.

Borrowing from the logic of Enterprise Risk Management, the Resilience Zone approach proposes to integrate such local area risk management measures into mainstream planning, zoning, and economic development strategies for each area. As illustrated on page 24 in **Figure 3**, a Local Area Risk Management approach would integrate the management of catastrophic risks with the management of other priority economic and social development risks, focusing on five core development objectives for the designated Zone:

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14 See Kiduk Moon, Downes, Rujner and Storch (2009). “Adaptation of the Urban Structure Type Approach for Vulnerability Assessment of Climate Change Risks in Ho Chi Minh City”. In: *E-Proceedings: 45th ISOCARP Congress 2009 “Low Carbon Cities”*. The Hague: ISOCARP. URL [http://www.isocarp.net/Data/case\\_studies/1596.pdf](http://www.isocarp.net/Data/case_studies/1596.pdf) (Accessed December 2010)

- ➔ economic attractiveness,
- ➔ reliable function,
- ➔ adaptability to change,
- ➔ performance for residents/users, and
- ➔ potential for reinvestment.

In other words, Local Area Risk Management focuses on managing risk and reducing vulnerability *in order* to advance *today's* priorities for the area. It thereby aims to overcome the identified disconnect between today's business and property risk management priorities and the requirements for longer term climate resilience.

**FIGURE 3. AN OVERVIEW OF THE LOCAL AREA RISK MANAGEMENT APPROACH**



## INSURANCE INNOVATION

Local Area Risk Management can also provide a mechanism for innovation with the insurance industry. The lack of insurance for certain risks is a major issue today. Canada, for example, is the only G8 country where homeowner insurance for overland flood is not available. Insurance for flood and similar weather and climate-related losses is needed to finance reconstruction, which otherwise puts a prohibitive strain on individuals, towns, and all levels of government. Insurers, local communities and other actors therefore share an interest in focusing risk reduction efforts where they will have not only the biggest impact but also enhance insurability.

Such action may even enable new, private sector insurance products. Risk exposures that cannot be cost-effectively managed or insured at the asset scale might be treated as part of a risk pool to be underwritten by the insurance industry. Working with or without an insurance broker, the local area risk management institution for the Resilience Zone could serve as an intermediary helping to organize these new purchasing groups. The pool arrangement would be designed to incentivize or require priority local area risk reduction measures to be taken,



with the benefit of further preserving local insurability as an outcome. The subscribers to each pool would have sufficiently similar risk exposures. Parts of the pooled risk would be transferred to insurers and reinsurers on the basis of their different areas of underwriting focus and expertise.

This type of approach to insurance is used with other complex entities and systems, such as corporations or utilities, involving a variety of different building types, business risks, and other exposures. Owners of larger building complexes often sell parts of the entity's risk to different insurers. In the United States, companies with large franchise or agent networks establish a single risk pool, registered under law as a captive insurance group. The captive insurance group manages the transfer of the group members' distinct mix of risks to insurers. The annual Business Insurance survey reported that there were 5,745 captives worldwide at the end of 2011. If a city or zone has a number of similar types of risks, to the extent that assets and residents/businesses face similar exposures the pool could potentially be expanded to cover aspects of risk across a number of areas.

The work and costs of establishing such a pooled risk arrangement are not likely to be substantially borne by the insurance industry itself. Furthermore, the transfer of a unique pool of risks, reflecting the unique risk exposures within these zones, will likely require policies from a number of insurers, reflecting their distinctive expertise and tolerance for different areas of risk. Therefore, the establishment and management of a functioning 'pool' that transfers pieces of risk to different insurers, and the management of policy subscriptions to a captive or similar risk transfer solution, will require the establishment of an institutional mechanism to serve both as the primary insured and as the coordinator of its subscriber group. Careful consideration needs to be given to issues of social equity to ensure that development of any such insurance arrangements for Resilience Zones do not further marginalise disadvantaged or the most 'at risk' communities.

Another possible direction for insurance innovation for coverage of the widely distinct exposures confronting urban areas could be parametric insurance. Parametric insurance particularly lends itself when a heterogeneous mix of buildings and other assets would be too complex to underwrite and insure via a risk pool arrangement. Parametric insurance is an index-based policy that provides a payout when local climatic conditions deviate by a specified percentage from the historic average of a chosen weather parameter (e.g., temperature or precipitation). The insured party receives an insurance payment according to the extent of deviation from the agreed climate index and according to a pre-defined payment formula. For instance, an automatic insurance payment may be made in the event of drought as a result of less than an anticipated amount of rain; or each time rainfall exceeds a chosen threshold over a specific number of days; or when surges in temperatures significantly exceed the historic average.

Ultimately, the aim of a local area risk management strategy is to develop customized approaches to managing, pooling, spreading and transferring climate change risks on a neighborhood or other local area basis, thereby maintaining the insurability of these areas over the long-term. Among the diverse reforms and innovations identified by participants in the San Diego and Toronto workshops, the following measures suggest the elements of a local area risk management strategy to build climate resiliency at the local area scale (see **Table 3** on page 26).

**Table 3. Selected Measures for Local Area Management of Climate Change Risks**

**CORNERSTONE #2: LOCAL AREA RISK MANAGEMENT**

(Examples of measures for: extreme heat, flooding, wildfire, sea level rise)

<p><b>Policy, Regulatory, Legal &amp; Fiscal Innovation</b></p>	<ul style="list-style-type: none"> <li>• Establish detailed GIS-based risk documentation for the area. Form partnership to increase data exchange on climate risk exposure between insurers and public entities.</li> <li>• Develop local area emergency management plans that include: provision for emergency water supplies, food delivery programs, cooling rooms, public water taps.</li> <li>• Implement incentives for local business continuity planning.</li> <li>• Organize collaborative cross-sector efforts to collect data, e.g. collective funding for flood plain mapping. Neighborhood scale flooding vulnerability assessments could be undertaken to build community-level awareness and buy-in for individual property and local area mitigation expenditures.</li> <li>• Plan &amp; design areas of ‘herd immunity’ with wildfire buffers, flood and storm surge protection barriers etc. on their peripheries.</li> <li>• Apply the use of maintenance assessment districts to allow homeowner groups to establish collective assessments for common risk mitigation investments.</li> <li>• Finance open space and coastal buffer protection with watershed and open space protection fees.</li> </ul>
<p><b>Product, Technological &amp; Business Innovation</b></p>	<ul style="list-style-type: none"> <li>• Establish decentralized police, fire, and emergency medical service units, catering to unique vulnerabilities or designated zones.</li> <li>• Engage a local community development corporation or business improvement area association to develop an insurable entity in collaboration with a large insurance broker to establish a single neighbourhood risk pool.</li> <li>• Utilities research the potential benefits of collaborating with property owners on a power circuit basis. Invest in circuit area back up power supply.</li> <li>• Explore using the Joint Powers Authority legal structure (California) to establish a group captive insurance mechanism for a district.</li> <li>• Include system reliability in evaluations undertaken for infrastructure capital planning.</li> <li>• Establish clear protocols for triaging customers during water and power shortages.</li> <li>• Provide incentives to elevate electrical and HVAC systems in flood prone basements, or to upgrade basements generally.</li> </ul>
<p><b>Institutional Innovation</b></p>	<ul style="list-style-type: none"> <li>• Establish a local coordinating body to champion existing risk management measures and incentives to the area, e.g., installation of sewer backwater valves, brush clearing norms.</li> <li>• Establish a special purpose vehicle for designated ‘resilience zones’ to serve as the area’s risk reduction and transfer agency.</li> </ul>
<p><b>Communications Innovation</b></p>	<ul style="list-style-type: none"> <li>• Organize local area ‘communications hubs’ in instances of brownouts, extreme storm and heat events, power outages, etc.</li> <li>• Establish special protocols to communicate preparedness and emergency routines for an area’s more vulnerable populations.</li> <li>• Provide public access to aggregated local area risk data, to provide a sounder basis for making investment and design decisions.</li> <li>• Communicate the risk posed by perimeter properties to other properties.</li> <li>• Communicate success of risk reduction activities already adopted (e.g., white and green roofs on local area micro-climates).</li> </ul>

***How can investors, property owners, and businesses in a Resilience Zone secure optimal outcomes and returns from local area risk management expenditures?***

Local area risk management provides a mechanism for identifying the expenditures in a local area that could be made to substantially reduce an area's vulnerability and risks. Resilience Upgrading draws upon these findings to determine how these expenditures could be attracted in the form of investments, i.e., with financial returns.

The identification of measures to reduce vulnerabilities and risks in a designated area raises an obvious question: Will government, property owners and businesses be willing to bear the costs of risk management and physical adaptation, especially if increasing risk exposures and events are driving investment and business to less exposed areas? The observable lack of adaptation-related investment in highly exposed North American metro areas (e.g., southern Florida, the Gulf Region, Atlantic coastal cities) suggests that budgets are not being reallocated in response to today's technically sophisticated climate risk assessments such as the one completed for New York City prior to hurricane Sandy.

There are two aspects to this question. In the first instance, are property and business owners willing to add increasing costs to their operations, thereby putting pressure on their current investment strategies and returns? Second, will the above indicated risk management and transfer mechanisms be sufficient to stop any trend towards disinvestment arising from catastrophic risk exposure?

These questions highlight a key premise of the Resilience Zone approach: that effective and adequate climate adaptation expenditure will only be mobilized if the development of 'resilience' can be pursued as a new investment-worthy proposition, and not just as a new cost category. Such a proposition must provide near-term support to property values and rents, and increased returns on business investments in the designated area.

Three key implications arise from such a premise:

1. Expenditures and technical expertise allocated to risk management and climate adaptation should be designed to improve the immediate amenities and benefits of locating in the area, while also periodically reassessing how risk may develop over time because of a worsening climate.
2. 'Resilience' itself must be pursued and marketed as a performance advantage of the local area—much as performance agendas such as 'livability,' 'competitiveness,' and 'green' have been pursued in the past. Resilience should and can be pursued in a way that makes the area a more advantageous and competitive choice relative to other locations and investment options.
3. Any special purpose institution for local area risk management might best be established as, or embedded within, a local re-development entity charged not only with risk management, but with the overall redevelopment of the designated Resilience Zone as a better place in which to live, do business, and invest.

In other words, establishing true momentum for climate adaptation may require the establishment of what could be called a ‘resilience premium’—market recognition of resilience as benefit and performance enhancement for which investors, tenants, and residents will make sufficient payments so as to cover the costs of additional risk management.

LEED certified green buildings once again provide a point of reference. Although the impetus for green building was a long-term concern for environmental sustainability, the design features of green buildings such as better natural lighting and quality HVAC systems provided immediate workspace benefits to tenants. Much of the market premium on rents and increased ROIs secured by these buildings is attributed to employee preferences for present day benefits, as much as or more than their long-term impacts.

In deliberating ways to increase the immediate local benefits of climate adaptation investments, the stakeholders in the San Diego and Toronto workshops typically identified the following areas of opportunity:

**Recreational amenities.** The establishment of physical buffers to protect developed areas from flooding or fires can be designed to provide attractive, everyday amenities such as parks, cycling and exercise corridors, and open air cultural facilities, which may otherwise be in short supply.

**Community facilities.** Workshop participants identified opportunities to improve the attractiveness and functions of community facilities, in particular in lower income areas, leveraging investments to upgrade them to also serve as emergency shelters. In turn, they identified the potential to design new emergency shelters for everyday uses such as childcare or senior citizen centers, community kitchens, and health services hubs.

**Improved retail facilities.** In similar fashion, some workshop participants identified the opportunity to involve retail mall operators in planning for extreme heat events. In addition to increasing customer loyalty as well as foot traffic during the summer season, preferential power supply could be provided during associated power shortages to incentivize malls to function as cooling centers during extreme temperatures.

**Improved sidewalks and streetscapes.** Drainage improvements to prevent flooding in traffic corridors can be integrated with improvements to sidewalks and with the greening of streetscapes. ‘Green streets’ is becoming a mainstream aspect of storm water management in cities like Chicago.<sup>15</sup> The associated ‘curb appeal’ improvements can also increase property values and rents.

These and other kinds of performance enhancing investments in resilience, generally also contribute in the following ways to overall economic development and property performance objectives in the exposed areas:

- ➔ Increased long-term operating cost predictability. Whereas local area risk management focuses on reducing costs arising from potential disruption to these critical services, an enhancement strategy focuses on improving and sustaining the day-to-day quality and cost-effectiveness of these services. A Resilience Zone can better guarantee stable operating and maintenance costs, such as for water, power, heating, and transportation.
- ➔ Increased choice and service flexibility. Investment in backup systems enhances not only the predictability, but also the quality of benefits in an area. For example, the multimodal transport options made viable through transit-oriented hub development allow users to customize modes of transport for each trip, in addition to providing alternatives in the instance of disruption to one transport mode.

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15 Cities like Chicago actively use ‘green streets’ programs as part of their storm water management strategies. See <http://epa.gov/region5/sustainable/stormwater-greenstreets.html> (Accessed September 2013)

- ➔ Enhanced health, safety and emergency (HSE) services. Enhanced services can also be used to attract and retain target tenants or residential demographics, which have their own unique HSE needs and concerns. Decentralizing police and emergency services units to increase responsiveness to extreme events can also support everyday enhancements to public safety, a key factor, for instance, in the functioning of entertainment and nightlife areas where safety is consumer priority. Dense inner city districts depend more upon pedestrian and bicycle-friendly streets, and the design of egress corridors for emergencies can also be undertaken to reduce everyday risks associated with competition between automobiles and these other modes of transport.
- ➔ Adaptive capacity and 'future proofing'. Resilience Zones can provide 'future proofing' benefits in a way that risk management alone cannot. Risk management focuses on the currently predictable risks to a particular area or system. However, in times of rapid environmental, technological, economic and demographic change, the ability to respond opportunistically to unexpected conditions provides further advantage.

## DEVELOPING VALUE IN LOWER INCOME AREAS

It is often assumed that the redevelopment or upgrading of an urban area, in particular to secure an investment return, must involve the displacement of small local businesses and lower income residents. However, reinvestment policies and programs can surely be designed to ensure the sharing of reinvestment benefits with existing residents and vulnerable groups. Recent best practice cases in the redevelopment of public housing areas in North America demonstrate that profitability and affordability are not necessarily incompatible with substantially improved performance.<sup>16</sup> Successful long-term neighborhood-based redevelopment initiatives, such as the Market Creek Plaza project in San Diego and Dudley Street Neighborhood Initiative<sup>17</sup> in the Roxbury neighborhood of Boston have brought tens of millions of new investment into their areas—along the way reducing historic risks—without significantly displacing the resident community. Rather, like many reinvestment programs for brownfields areas, they can stabilize neighbourhoods and stop deterioration of household wealth.

## SPECIALIZED COMMUNITY RE-DEVELOPMENT COMPANIES

The redevelopment of a district or precinct is, of course, significantly more ambitious and complicated process than establishing local area risk management capacity. The difficulties of transforming existing built areas and their infrastructure/service systems are widely recognized in the urban planning and property development industries. These difficulties include, but are not limited to, problems of land assembly, liens and rights of way, historical liabilities, and grandfathering of semi-formal and informal claims and tenure rights. Further complexities include the challenges of different building types and conditions, varieties of economic activities with sensitive place-based dependencies, and the claims and preferences of organized resident communities. These difficulties are the primary reason why local governments establish special planning districts for built areas requiring redevelopment, as well as special re-development companies or other special purpose vehicles (SPV) to manage upgrading comprehensively within these zones. The establishment of re-development companies was a particularly critical element of successful brownfields re-development practice.

16 For a report on recent Canadian case studies see: Alex-andra Moskalyk (2008). "The Role of Public-Private Partnerships in Funding Social Housing in Canada," *CPRN Research Report*. Ottawa: Canadian Policy Research Networks (CPRN). [http://www.cprn.org/documents/50550\\_EN.pdf](http://www.cprn.org/documents/50550_EN.pdf) (Accessed March 2013)

17 See <http://participedia.net/en/organizations/dudley-street-neighborhood-initiative> (Accessed March 2013)

Local re-development corporations, focused on special upgrading objectives for specific areas or infrastructure systems, have been at the forefront of innovation in urban development and finance. Examples of their innovations include creative use of land leases, land-swaps, ‘bonusing’ incentives, value capture schemes, tax-increment debt financing, revolving loan funds, and project guarantees.

The development of responsive local institutions with the combination of special planning controls, financing powers, financial instruments, and re-development capabilities is a critical capacity-building requirement in societies wishing to rapidly and effectively reduce place-specific climate and other disaster risks. Such an entity could also assume the role of the insured in a local area insurance pool or group captive arrangement. Much as is the case with establishing a local insured entity to hold, manage and transfer selected area-wide risks, without an SPV no entity views *the zone* (as opposed to just individual properties) as its main unit of value creation. An SPV can focus on optimizing revenues and asset values for all assets located in the district, i.e., of the district *as a location*. The SPV plans, sources, coordinates, and integrates the scores of investments that must take place in the course of upgrading. Such an entity can manage the complexity of such a project because of its specialized focus on the particular district or zone, factoring its unique risks, risk management capacities—and opportunities. Part of the increased value of the district’s assets can then be captured by the SPV or local government in the form of fees and special charges, special property taxes, or the improvement and sale of its own property holdings for further upgrading investment.

While considering the resilience upgrading approach, the participants in the San Diego and Toronto workshops identified the following kinds of measures to improve local amenities and attractiveness as they reduced climate risks (see **Table 4**, page 31).

**Table 4. Selected Measures for Local ‘Resilience Upgrading’**

**CORNERSTONE #3: RESILIENCE UPGRADING**

(Examples of measures for: extreme heat, flooding, wildfire, sea level rise)

<p><b>Policy, Regulatory, Legal &amp; Fiscal Innovation</b></p>	<ul style="list-style-type: none"> <li>• Create a Special Assessment District or Tax District, or institute a Local Improvement Charge, associated with the establishment of the Resilience Zone with specific focus on financing redevelopment projects that reduce priority risks and increase local area resiliency.</li> <li>• Evaluate the issuance of municipal resilience bonds for upgrading of designated Resilience Zones.</li> <li>• Develop a city- or region-wide resiliency standard and measurement protocol.</li> <li>• Undertake economic and planning studies to evaluate the impacts of resilience on local business sectors, vulnerable populations, social equity etc.</li> </ul>
<p><b>Product, Technological &amp; Business Innovation</b></p>	<ul style="list-style-type: none"> <li>• Focus on building more resilient infrastructure.</li> <li>• Establish local community power storage/generation, e.g., micro power generation and alternative power sources localized to a community rather than individual structure.</li> <li>• Establish micro power grids in particular at business park and campus scales, tailored to the demand patterns of tenants.</li> <li>• Scale demonstrated “best practices” to establish cooled micro-climates, such as white and green roofs, and green area restoration.</li> <li>• Develop amenities enhancements that also serve as refuges during extreme weather events: shade structures in parks, recreation facilities, capture wind.</li> <li>• Design open space and coastal buffer protection areas so that they serve as parks and include recreational and other community facilities.</li> <li>• Develop or re-design community facilities that serve as everyday hubs for local retail, health clinics, recreation, shared workspaces, and/or continuing education classes but also provide emergency shelters and back-up water, power and communications during emergencies.</li> <li>• Develop food delivery services in partnership with grocery chains and food service companies to provide emergency food delivery for vulnerable populations in instances of public transit failure.</li> <li>• Re-landscape parks, gardens, and roadways for resilience in extreme heat and drought as well as for storm water retention and percolation.</li> <li>• Upgrade building facades and create/implement new maintenance procedures for structures, reflecting changing climatic conditions and extremes.</li> <li>• Establish a service to install smart meters that automatically triage certain power usage (e.g., bedroom lighting) during brownout periods but maintain priority uses (e.g., refrigeration).</li> <li>• Establish a power pricing gradient that rewards reduced consumption at peak periods or for low priority uses.</li> </ul>
<p><b>Institutional Innovation</b></p>	<ul style="list-style-type: none"> <li>• Establish a special purpose vehicle for one or more Resilience Zones to manage the redevelopment process in each, integrating local area risk reduction measures into the overall upgrading of the area for current residents, businesses, and users.</li> </ul>
<p><b>Communications Innovation</b></p>	<ul style="list-style-type: none"> <li>• Develop a community rating and accreditation system to enable the comparative rating of the resilience of local areas and buildings.</li> </ul>

***Facilitating market recognition of a ‘resilience premium’***

The success of a Resilience Zone strategy will depend upon the confidence that reductions in long-term catastrophic risk exposure, combined with present day enhancements to performance, will sustain if not increase property values and business opportunities in the designated area. To achieve such market recognition, marketing will not likely be sufficient. It is very difficult to market a new form of property performance, such as ‘resilience,’ that is not yet defined or widely recognized in the property industry. An effective communications strategy, therefore, will likely require performance benchmarking and key performance indicators that prove the benefits of the area’s resilience features.

The evolution of green building practice and of downtown revitalization practice suggests the efficacy of such an approach. ‘Green building’ was a new category of property and urban development performance that could have easily become a generic marketing label on apples-and-oranges operating efficiencies. Green building became a mainstream performance area in the building industry—ultimately recognized in the market with premium investor returns, asset values, and rents—because it was defined through a widely accepted standard, e.g., LEED. The success of the US Green Building Council and LEED highlights the degree to which market recognition of enhanced performance depends upon communication measures that ensure the clarity and reliability of performance claims.

Cities and counties that choose to lead the establishment of market support for climate adaptation—much as was the case of Portland, Seattle, and Vancouver during their early pioneering of green building—may consider a communications strategy in a classic who-what-when-how manner:

- ➔ Communicating ‘what.’ As suggested above, it will be important to establish a rating standard, with widely applicable definitions, of the core elements of resilience. Intuitively compelling and methodologically robust indicators of performance can be developed with relation to each of these elements. The establishment and acceptance of a standard typically requires collaboration across a group of leading cities and counties. This will enable market benchmarking of the de-risked and enhanced area relative to other areas in the region and nationally. It also supports the property industry in each participating city and county to build capacity to deliver resilience as a form of performance.
- ➔ Communicating ‘how.’ If the above approach to ‘what’ is accepted, then the ‘how’ of communicating resilience is initially more one of data than of the creative use of media. Place branding will be a critical requirement, but a strong brand for both an area and for the Resilience Zone concept generally will depend upon confidence in data about differentials in relative risk and performance.
- ➔ Communicating ‘who.’ The above demands of ‘what’ and ‘how’ highlight the extent to which establishing a market premium on the basis of resilience will require collaboration, not only locally, but at regional or national market scales. The implied rigor of this approach indicates the need for collaboration across sectors, professions, and local markets to establish common definitions and measures, to provide training and education to professionals, and to build



a community of practice. Lessons in this regard can again be drawn from the success of brownfields redevelopment and green building as new development practice areas.

- ➔ Communicating ‘when.’ A communications strategy that is built upon material, delivered benefits more than upon the forward selling of normative policy ambitions also has implications for the timing of communications. Substance, demonstration, and credible third party endorsement must drive the strategy if resilience is to be accepted as a new norm in the city-building process.

The participants in the San Diego and Toronto workshops consistently highlighted the importance of establishing measurement protocols and standards for resilience, whether solely for their city or as a national standard development initiative. This and other communication strategy measures to secure a potential market premium from resilience-building efforts are summarized in **Table 5** below.

**Table 5. Selected Measures for Communicating Resilience Benefits**

**CORNERSTONE #4: COMMUNICATING RESILIENCE BENEFITS**

(Example of measures for: extreme heat, flooding, wildfire, sea level rise)

<b>Policy, Regulatory, Legal &amp; Fiscal Innovation</b>	<ul style="list-style-type: none"> <li>• Benchmark the Resilience Zone with competing areas in terms of functional performance, including resilience/reliability of performance.</li> </ul>
<b>Product, Technological &amp; Business Innovation</b>	<ul style="list-style-type: none"> <li>• Join with a network of municipalities and representatives from the building, utilities, insurance and other sectors to develop a national resilience rating system with third party verification. The system would advance standards and inform choices regarding resilience investments and performance. It would enable the insurance sector to evaluate and price according to documented reductions in risk.</li> <li>• Include information on resilience characteristics or ratings in the MLS database.</li> <li>• Create a resilient district certification standard and process.</li> <li>• Document resident, tenant and user satisfaction.</li> <li>• Engage the marketing industry in developing effective communications strategies and mechanisms.</li> </ul>
<b>Institutional Innovation</b>	<ul style="list-style-type: none"> <li>• Form a partnership between local universities and foundations to establish a local or regional center of excellence on urban resilience, both supporting and studying local Resilience Zone activities.</li> <li>• Create a local or regional risk mapping consortium to collect, clean, productize and provide risk data to various stakeholders and sectors for their respective planning and investment purposes. Use this data to support implementation of resilience ratings.</li> <li>• Support establishment or leadership of a national organization/institute to promote urban resilience, much like the National Fire Protection Association in the late 19th century.</li> </ul>
<b>Communications Innovation</b>	<ul style="list-style-type: none"> <li>• Establish place-branding efforts for each Resilience Zone to communicate the area's unique resilience-related benefits.</li> <li>• Host a regional/national event on resilience performance to attract international attention to local Resilience Zone activities.</li> <li>• Provide project tours that make the area an international ‘learning destination.’</li> <li>• Establish ongoing education &amp; training for property managers and for new property owners.</li> </ul>

# Conclusion

The main concepts presented in this paper, and tested in the workshops, are substantially derived from a legacy of established North American city-building practices, which were once the unproven ‘next practices’ of their day. The Resilience Zone framework calls upon mechanisms that have been successfully applied to equally risky areas and problems. The combination of risk management and investment mobilization in the Resilience Zone approach reflects the logic of Enterprise Risk Management (ERM), which has been embraced by corporations, utilities, and governments as a new core planning framework, not only for risk management but also for prioritizing business opportunities. The basic premise of ERM is that enterprises must assess and address risks and opportunities together, across their established business silos, as two sides of the same coin. Rather than approaching risk management and value creation in an urban area as two separate strategies, they should be optimized together. And rather than limiting risk management and value creation to individual assets and enterprises, they must also be pursued at the scale of the entire, exposed area.

The Building Resilient Cities workshop series has engaged collaborators in the city-building process, across sectors, to explore local area risk management and resilience upgrading as an opportunity in the context of climate and other catastrophic risks. The primary objective has been to catalyze further deliberation of resilience as a city-building opportunity, as a follow-up to established local climate adaptation planning activities.

When entering into this deliberation, it will be worthwhile to recall the extent to which the growth and resilience of cities has always been underestimated. The history of city-building is a history of innovation to overcome the risks of location in order to build value and establish place-based economic advantages. The underlying economic foundation of cities (i.e., economies of scale and economies of density) have constantly instigated new forms of collaboration to further secure and optimize urban land and assets, even in the face of sometimes extreme risk. These same fundamental advantages remain at the disposal of today’s city-building communities as they now face the newly emerging risks of a destabilized global climate regime.