



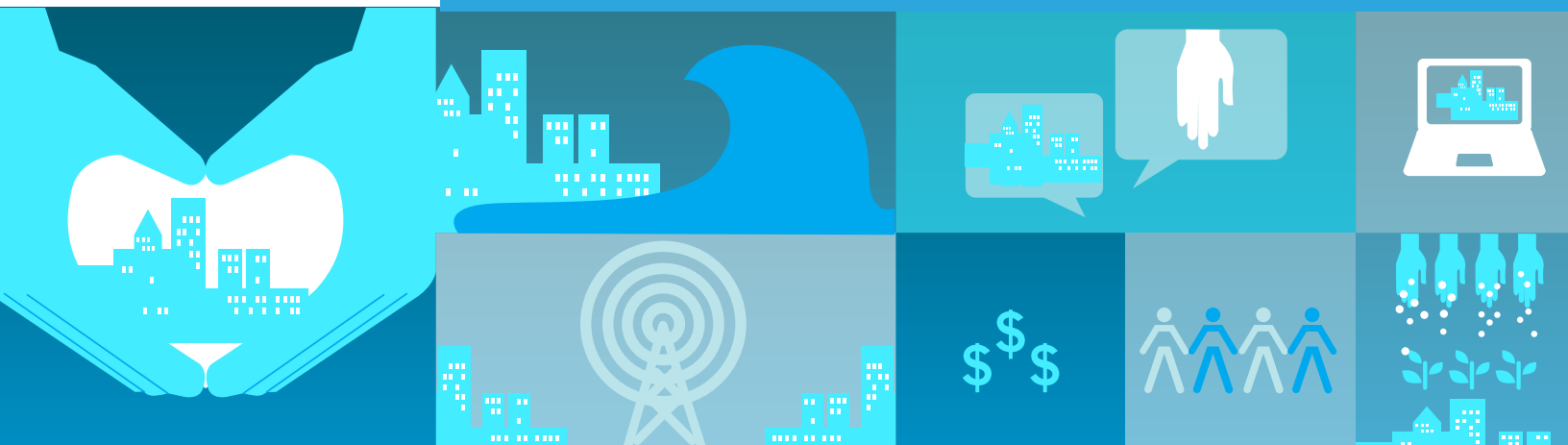
# Building climate change resilience in cities

## The private sector's role



With insights from

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### The payoffs of being proactive: Reaping dividends by engaging business in resilience-building efforts

In 2013, in the city of Tacloban in the Philippines, business owners started shutting shop after desperate survivors of Typhoon Haiyan turned to looting. As the storm's aftermath illustrates, a single urban disaster can spark many others, from crime to profound economic loss. But by developing proactive plans that involve all affected parties rather than tackling isolated risks such as possible power outages, cities can survive and emerge stronger from shocks and stresses.

Some call this the "resilience dividend"—a field that The Rockefeller Foundation has explored extensively in its research—or creating unforeseen opportunities, rather than disruption, through collective, proactive preparation and responses. The long-term benefits of the resilience dividend might include better job prospects, economic opportunity, social cohesion or equity.

Cities are extremely complex ecosystems. Physical assets such as offices, hospitals, schools and transit systems are often concentrated in small spaces and interact with large and diverse populations, including commuters, tourists and residents. This density can intensify the impact of storms, floods, disease outbreaks and other events—and their costs.

Indeed, economic losses alone from natural catastrophes and man-made disasters are costly, both financially and in human terms. In 2013, these events totaled about \$140 billion, according to global reinsurer Swiss Re. But even one major disaster impacting a large urban center can create disproportionately high costs and economic devastation. The 2011 flooding around Bangkok, Thailand, for instance, generated \$47 billion in economic losses in a short time.

And across New York and New Jersey, post-Hurricane Sandy's larger costs ranged from damaged business structures and equipment, to lost production from power cuts, to workers' inability to commute and subsequent income reductions or job losses. Roughly 10,000 manufacturing facilities were forced to close after the hurricane. Travel and tourism ventures also suffered: in Atlantic City, New Jersey, casinos alone reported some \$5 million in daily losses.

#### Looking beyond disaster

Climate change generally impacts cities over two main time frames: after weather-induced disasters such as storms or floods, and over slow, gradual periods, based on temperature and rainfall pattern shifts.

Most vulnerable to the first category of climate change-induced disaster, globally, are Asian cities, according to Maplecroft, a global risk analytics, research and forecasting firm in Bath, England. Dhaka, Bangladesh; Mumbai and Kolkata in India; Manila in the Philippines and Bangkok, Thailand, are subject to "extreme risk" among 50 cities in its "Climate Change and Environmental Risk Atlas."

Globally, however, the gradual onset of climate change-induced shifts may be more worrisome in both developed and developing nations. One effect of rising temperatures, for example, is the increased frequency of heat waves. For a sense of the impact, consider that on the mostly non-air-conditioned London Underground, commuters face summer temperatures higher than levels permitted by the European Union for transporting livestock.

Longer-term temperature changes may trigger the rising incidence of tropical diseases, as well. World Health Organization research suggests that global temperature increases of just 2–3°C raise the number of people at risk from malaria by several hundred million.<sup>1</sup>

Crime may also rise if urban dwellers must abandon their homes after environmental disasters linked to climate change, such as floods or hurricanes. Most affected are often climate change–driven migrants. For these environmental refugees, the family safety nets they had at home disappear, leaving them vulnerable, particularly if they have moved to a more costly urban environment. Under such pressure, migrants are particularly vulnerable to exploitation, violence and marginalization.<sup>2</sup>

The private sector is paying attention. Rising temperatures and pollution threaten companies' productivity if workers' health suffers or commuting is disrupted. Some 79 percent of cities report that warming temperatures could hamper the ability of businesses to operate successfully in their cities, according to CDP, a global nonprofit organization that works with investors, companies and cities to measure and disclose the environmental impact of their activities.<sup>3</sup> These slower-moving, but potentially powerful impacts point to the importance of viewing resilience as an ongoing, collaborative endeavor.

### A wider lens on resilience

These shared concerns and interests in positive outcomes are drawing a broad swath of stakeholders into the climate-change and urban-resilience conversation, and for good reason. Confronting and responding to these issues collectively is imperative because the issues are so complicated and intertwined, and require tapping into the energy and expertise of all. Take poverty, for example. If properly addressed, social cohesion improves, and thus does a city's ability to recover from disaster. "Community resilience is founded on the resilience of individuals, and if they are living on the edge, in abject poverty, they have no ability to be resilient," says Jo da Silva, founder of Arup International Development, a nonprofit division of Arup Group, a London-based global design, planning and engineering firm.

This means city governments must provide social safety nets, health, education and affordable housing to poor and marginalized populations. Absent these, the likelihood of crime and civil unrest rises, particularly if income gaps between the wealthy and poor rise considerably. And when cities lack social cohesion, they are less able to recover from crises or disruptions, such as epidemics, natural disasters or widespread power outages.

"Communities that feel tightly knit and have a mutual stake in a return to normality can rally," says Michael Moran, managing director of global risk analysis at Control Risks, a risk consultancy. "You see the opposite ... in places like New Orleans, where a large portion of the city resented the status quo and the damage [from

Hurricane Katrina] was significantly greater in the poorer areas. That's a toxic mix."

### Integrated responses

If the risks cities confront regularly are closely interwoven, so, then, are the solutions.

Take Bogota, Colombia's, bus rapid transit system, known as the "TransMilenio," developed between 1998 and 2000 to clear the city of traffic jams and smog-spewing minibuses. Centrally controlled larger buses in dedicated lanes helped curb congestion and pollution.

But this well-designed transit system also spurred a number of other city improvement projects, which boosted civic pride and cohesiveness. They included more libraries, schools, nurseries and public parks. Collectively, these helped cut traffic accidents by about half in TransMilenio corridors, increase school enrollment levels by 31 percent and reduce crime through the addition of new paths and parks. In 2003, Bogota's new 211 miles of bikeways were the largest outside China.

Research by the University of Illinois has found that those living near green spaces are less apt to turn to crime, because they have a stronger sense of community, can cope better with everyday stresses and have a lower tendency toward aggression and violence. Because green spaces reduce mental fatigue, they also relieve the feelings of violence and aggression that are associated with fatigue, the researchers found.<sup>4</sup>

### Business plays a key role

For similar successes elsewhere in urban resilience building, the private sector is a key stakeholder, since risks to cities are also risks to business continuity. When urban transport shuts down, for example, workers cannot reach factories. When communications systems fail, so do manufacturing supply chains. It is therefore in the private sector's interest to work with city officials and other stakeholders on resilience.

The private sector must also ensure that its own operations can withstand shocks since, as employers, companies are responsible for the economic and social welfare of a large proportion of urban residents. "The role of business is to ensure that they have insured themselves against disruption, that they help people get to work as quickly as possible after an event," says Shailaja Annamraju, climate change and economic adviser at the UK's Department for International Development.

Businesses also provide essential services such as power, water and sanitation. "If you look at the things a city does, some is done by government, but an awful lot is done by business," says Ms. da Silva of Arup. "Businesses are fundamental to the continuity of services."

Finally, with government budgets increasingly tight, municipal administrators will need to harness the resources of the corporate sector in resilience-building efforts.

Moreover, with its capabilities in innovation and technology and its ability to scale up smart ideas, business can also address the challenge of urban resilience in new ways. The private sector has long had to implement strategies to ensure business continuity in its own operations—strategies that can be applied to urban resilience.

Best practices include working with industry partners and suppliers to conduct supply-chain risk assessments, creating data-sharing platforms to increase transparency on shared urban risks and working with standards bodies to develop streamlined, replicable resilience procedures.

As the role of business gradually expands beyond its own operations and service provision, companies are participating in broader coalitions to address risks ranging from climate change to urban crime. For example, Business in the Community—a British nonprofit corporate membership organization founded in 1981 as a response, in part, to riots in Brixton, Merseyside and other urban areas—encouraged businesses to collaborate with local agencies on pre-recruitment training to address a skills deficit and high unemployment in urban areas,<sup>5</sup> a strategy that remains a focus.

Extreme events can also catalyze collaborative business action. For example, an unprecedented number of floods, storms and bushfires prompted the formation in 2012 of the Australian Business Roundtable for Disaster Resilience and Safer Communities, which conducts research to inform public policy. Members include the CEOs of Insurance Australia Group, Investa Property Group, Munich Re, telecom company Optus, and Westpac Group, a banking and financial-services provider.<sup>6</sup>

In 2014, the body recommended that the Australian government create an open-source platform providing a single point of access for critical information on natural disasters. Collectively, such efforts could save Australia's economy up to A\$2.4 billion by reducing the cost of natural disasters, by Roundtable estimates.

Given the complex and interdependent risks cities face, more cross-sectoral collaborations are needed. Yet motivating municipal governments to connect the dots both internally and

across sectors has not been easy. “One of the really significant challenges in getting to grips with resilience is thinking about cities holistically as systems, rather than in sectoral silos,” says Ms. da Silva.

As such, the private sector is a logical player to help coordinate and calibrate resilience-building actions. In the course of their commercial activities, companies may interact with a wide range of city departments—from law-enforcement agencies to public utilities—and therefore have the potential to act as broker, involving a broad range of government players in urban resilience discussions.

To help cities work toward this bigger and more holistic picture of resilience, the World Bank is developing a diagnostic tool that can evaluate criteria ranging from the strength of the physical infrastructure to its level of economic diversification to its ability to cope with social unrest.

Meanwhile, the Global Commission on the Economy and Climate has launched a new initiative—the New Climate Economy—to analyze and communicate the economic benefits and costs of addressing climate change. Its most recent report<sup>7</sup> concluded that dense urban centers focused around mass transit can not only be low-carbon, healthy, dynamic engines of growth, but could also reduce urban infrastructure capital requirements by more than \$3 trillion over the next 15 years. This is another example of the resilience dividend.

Cities are only starting to grasp the links between risks such as climate change, urban unrest, crime and disease. And of all stakeholders, entrepreneurs are particularly important for resilience. They were the first to begin rebuilding Tacloban after Typhoon Haiyan, according to Ms. da Silva. “The city was decimated, but small cafes and shops materialized from the debris,” she says.

To reap the resilience dividend, city governments must collaborate better internally and harness the energies of all stakeholders, from corporations to citizens. By building systems that address a number of interconnected issues linked to disruption and climate change, cities can not only survive disasters, but also fortify their social and economic foundations for the future.

<sup>1</sup>World Health Organization website: <http://www.who.int/globalchange/climate/summary/en/index5.html>

<sup>2</sup>International Report 2010 on Crime Prevention and Community Safety: Trends and Perspectives, International Centre for the Prevention of Crime

<sup>3</sup>CDP Cities 2011: Global Report on C40 Cities, KPMG Advisory N.V., CDP, 2011

<sup>4</sup>How cities use parks for community revitalization, American Planning Association, 2007

<sup>5</sup>Business-led Corporate Responsibility coalitions: learning from the example of Business in the Community in the UK – An Insider's Perspective, David Grayson, 2007

<sup>6</sup>Building an Open Platform for Natural Disaster Resilience Decisions, Deloitte Access Economics, July 2014

<sup>7</sup>Better Growth, Better Climate, The New Climate Economy Report, September 2014

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### Date City, Japan:

## Building a sustainable agricultural industry after disaster

In 2011, Date City, Japan, faced daunting challenges following an interlinked earthquake, tsunami and nuclear disaster in its home state of Fukushima. Given the city's reliance on agriculture, cleaning up contaminated farmland was a priority. But as Date City made progress in its decontaminating efforts, it quickly encountered a bigger challenge: persistent food safety fears, which triggered a fall in agricultural sales and threatened local livelihoods. Yet, as this case shows, the crisis served as an opportunity for the city to adopt sustainable farming practices, revitalize its economy and rebuild its dwindling population.

Located in a fertile region of the prefecture, Date City is renowned for the quality of its fruit, vegetables and rice. After the nuclear accident, decontamination efforts and rigorous testing confirmed its produce was free of toxins.

However, consumers weren't convinced. Sales fell sharply, as did farmers' incomes.

"The nuclear accident has dealt a solid blow to farming in Fukushima by contaminating vast swaths of land and frightening Japanese consumers so much that they shun our products," Yoshihiro Watanabe, a mushroom and rice farmer from Fukushima, told the Inter Press Service in 2013.

Young people also left Date City, which threatened the long-term viability of local agriculture and reduced city tax revenues.

To help address this problem, technology company IBM offered assistance through its Smarter Cities Challenge project, which provides pro bono consulting services to cities around the world. City officials, initially skittish about the prospect of the collaboration, ultimately warmed to the idea.

"We weren't certain they fully understood the specifics of the Japanese farming industry," says Shouji Nishida, Date City's mayor. But municipal leaders later came to the conclusion that a different perspective might be helpful, he adds.

As a first step, the IBM team conducted a survey of 4,500 of its employees in Japan to analyze consumer perceptions and identify measures that might appeal to Date City produce shoppers.

Findings showed that consumers sought information from a trusted third party, rather than the government. As a result, the city administration, the Fukushima prefecture, Japan Agriculture (a trade association) and individual farmers came together to develop consistent communications assuring consumers about the safety of Date City food products. These messages were delivered through brochures at farmers' markets and supermarkets. Social media also proved a powerful channel for relaying facts and testimonials about Date City's food safety.

During this ongoing process, collaboration proved critical. “We needed to work together for negotiations with key retailers, such as supermarket chains, to recover from the harmful rumors and to engage in promotional activities aimed at consumers,” the mayor says.

And farmers embraced the prospect of change. Paul Chang, who played a leading role on the Smarter Cities Challenge team, recalls meeting a young, tech-savvy strawberry farmer in Date City. “He had a Twitter and Facebook account and was posting about the harvest for that day,” he says. “So he was taking a very modern approach to marketing his products.”

Also, to encourage larger-scale, more economically viable farming, the city administration and the prefecture worked to simplify and adapt legislation governing the ownership of farmland, which did not allow it to be sold or combined.

Finally, to help modernize Date City’s agriculture, IBM introduced farmers to technologies such as localized weather-prediction tools, which allow farmers to plant and harvest more efficiently, potentially increasing productivity and profit margins.

“People are making a virtue out of necessity by having an opportunity to leapfrog technologies,” said Lady Barbara Judge, after visiting Date City in her role as deputy chairman

of the Tokyo Electric Power Company’s Nuclear Reform Monitoring Committee.

Market analytics tools also helped identify higher-margin sales channels at, for example, department stores, which helped increase farm revenues. “Hopefully, that will cause younger people to look at [farming] as a [viable] profession,” says Mr. Chang.

While the city is still implementing the recommendations, the nuclear disaster proved a catalyst for innovation and allowed civic leaders to put Date City’s agriculture sector on a more sustainable path.

The farming industry has, for example, introduced technology to improve quality control through the use of IC (identity code) tags, which use radio frequency identification (RFID) technology to track the logistics of its produce. And the city’s agricultural industry is now working with supermarkets and corporate cafeterias to establish special kiosks to distribute free fruit samples and answer consumers’ questions.

Meanwhile, the mayor says that the IBM consultation “reminded us that we should evolve from merely taking defensive measures to actually making sweeping, proactive reforms.”



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### Surat, India:

## Expanding prosperity through collaborative resilience planning

For the business community of Surat, a thriving diamond-polishing and textiles center in the Indian state of Gujarat, preventing disruption of commercial operations has long been a struggle. Constant flooding resulted in industrial employees departing from the city, leaving businesses without essential workers. However, resilience investments involving both public and private sectors are now paying off in better infrastructure. This has not only reduced the effects of flooding on people's lives, but has also shored up the city's competitiveness as a business hub.

"By taking an active role in city resilience, business in Surat can have better control of its finance, manpower, technology and managerial ability," says Kamlesh Yagnik, former president of the Southern Gujarat Chamber of Commerce and Industry, which has been a prominent participant in Surat's resilience-building efforts.

In fact, key to Surat's success has been the city's ability to work closely with business, to create mechanisms to forge consensus and facilitate collaboration among a broad range of stakeholders in resilience-building efforts.

### Floods – and the plague

Surat is one of India's most flood-prone cities. The Tapi River, which traverses Surat, has extremely high tidal ranges and covers large low-lying areas. Over heavy rains, the city is also vulnerable to discharges from the Ukai dam, which lies upstream. Pressure to keep the dam's reservoir full for irrigation further hampers flood prevention, while rapid urbanization has expanded developments and narrowed the banks of the Tapi.

Given these multiple risks, flooding is a regular occurrence. "There is a many-centuries-old history of devastating storm-surge impact that has determined the location of traditional settlements, but has been neglected in the planning of much of the city," says Aromar Revi, director of the Indian Institute for Human Settlements, an education institution.

Moreover, if poorly managed, floods create stagnant, contaminated waters, exposing citizens to gastrointestinal illness and diseases carried by mosquitoes or other "vectors."

Slums along Surat's riverbank and tidal creeks, where many of its gem and textile industry workers live, add another layer of economic vulnerability. Both industries rely on large numbers of low-paid workers, about 60 percent of whom come from outside the city in search of employment. These migrant workers are most likely to be affected by floods. And if they leave the city as their homes collapse or basic services cease, the city's industries are unable to operate.

Despite efforts to shore up its preparatory responses following two severe floods in 1994 and 2006, much additional repair and revitalization work remained.

In 1994, after a flood left the city waterlogged for weeks, an even more dangerous health threat emerged: rats carrying the plague. "That brought [Surat] onto the world map and to the attention of the people who matter," says Mr. Revi. In response, the city improved its infrastructure and water-management processes, and introduced a solid-waste collection system.

But, despite these efforts, following another flood in 2006, fresh memories of the 1994 flood and plague prompted more than 70 percent of migrant workers to flee the city. Migrant workers were left in the dark as power, phone and transport infrastructure failed, impeding their efforts to return or move around the city. Production resumed nearly a month later, triggering losses of about \$4.5 billion, much of that resulting from business interruption.<sup>1</sup>

These stark statistics underscore the importance of ongoing communication with all residents to prepare them for shocks well before disaster strikes.

### Building resilience over the long term

Clearly, much resilience-building work remained because flooding would continue, city officials concluded. Better long-term planning and a range of interventions were required. The city needed to address business interruption and the threat of disease, and to prevent floods from driving away migrant labor. And part of the solution involved more cooperation between businesses and government.

In 2008, Surat was selected as one of the cities within the Asian Cities Climate Change Resilience Network (ACCCRN), an initiative that helps cities plan, finance and implement their resilience strategies. Through ACCCRN, Surat learned lessons from other cities and drew on advice from a team that included experts from Taru Leading Edge, a consultancy in India that focuses on urban issues, disaster risk reduction and disaster management.

Early actions included developing a system alerting citizens when the dam approached capacity. The End-to-End Early Warning System (EEEWS) transmits real-time data from monitors at the Ukai dam to city officials. To stem the exodus of migrant workers after floods, businesses also developed alternative transport systems for workers if urban services failed.

To address potential disease outbreaks, businesses worked with government to send workers with signs of illness to local hospitals, and provided subsidized health services. Surat Municipal Corporation, the local government body responsible for the administration of Surat, now uses text messages to monitor disease outbreaks by collecting health updates from 470 hospitals, urban health centers and private hospitals and clinics.<sup>2</sup>

To expand on these efforts, institutions and jurisdictions from community groups to city, state and national agencies improved their coordination of water management. In 2011, the city established the Surat Climate Change Trust, where a range of stakeholders can collaborate on climate-related issues. “Everyone decided to work together in this area,” says Mr. Yagnik.

Most recently, the city government earmarked 10 million rupees of the municipal budget to fund continuous work on initiatives to prevent climate change (such as energy efficiency), something Mahesh Rajasekar, director at Taru Leading Edge, views as a vital step. “Climate resilience is not something you do just once,” he says. “It requires constant evolution.”

Already, Surat’s resilience-building efforts have paid off. In 2013, for example, EEEWS gave Surat time to respond locally, preventing widespread flooding across the city. “The flood management plan averted a major flood,” Mr. Revi notes.

The city’s health-monitoring system has also limited the spread of illnesses, such as bacterial infection leptospirosis, which initially rose as a result of rapid migration, but is now falling.<sup>3</sup> The SMS system helped Surat significantly reduce the incidence of vector-borne diseases, as well.

Mr. Yagnik sees many benefits emerging as a result of corporate-sector collaboration on urban resilience. “Resilience-building businesses provide products and services that improve infrastructure, access to scarce resources and basic services,” he says.

By addressing many issues—from health to business continuity—Surat’s adaptive strategy demonstrates how an integrated approach to resilience can fortify the economic prospects of the entire community, from the poor and vulnerable to employers in key industries. This approach, say the authors of an ACCCRN policy briefing, is critical to managing urbanization: “How [governments] deal with the twin challenges of growth and climate security will fundamentally shape the sustainability of national economic growth and competitiveness,” the report states.<sup>4</sup>

<sup>1</sup>Kanitha Kongrukreatiyos, “Saving Surat: Building a Resilient City,” October 1, 2013, Rockefeller Foundation, 100 Resilient Cities website: <http://www.100resilientcities.org/blog/entry/saving-surat-building-climate-change-resilience-against-floods>

<sup>2</sup>Umamaheshwaran Rajasekar, Gopalakrishna Bhat, and Anup Karanth, “Urban Service Monitoring System (UrSMS),” TARU Leading Edge

<sup>3</sup>Umamaheshwaran Rajasekar, Gopalakrishna Bhat, and Anup Karanth, “Urban Service Monitoring System (UrSMS),” TARU Leading Edge

<sup>4</sup>Meenu Tewari, Saon Ray, Amrita Goldar, Indro Ray, Sahana Roy Chowdhury, Zeba Aziz and Vidhya Unnikrishnan, “Urban Climate Change Resilience,” Policy Brief 5, UCCR Policy Brief Series, ACCCRN, Indian Council for Research on International Economic Relations