CITIES TAKING ACTION
HOW THE 100RC NETWORK IS BUILDING URBAN RESILIENCE
ABOUT 100 RESILIENT CITIES

100 Resilient Cities - Pioneered by The Rockefeller Foundation (100RC), helps cities around the world become more resilient to the physical, social, and economic challenges that are a growing part of the 21st century. 100RC provides this assistance through funding for a Chief Resilience Officer in each member city to lead resilience efforts; resources for drafting a resilience strategy; membership in a global network of peer cities to share best practices and challenges; and access to solutions, service providers, and Platform Partners from the private, public and NGO sectors who can help them develop and implement their resilience strategies. Learn more at www.100resilientcities.org
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Dear colleagues and friends,

As I write this letter, in the lead-up to the 2017 Urban Resilience Summit, it is truly extraordinary to consider the incredible group of people who have taken part in our movement over the last four years. When we started this organization in 2013, we had no cities, no staff, no CROs, and no Platform Partners. Together we now stand, not that many years later, on the leading edge of a movement that I believe can touch billions of lives.

Over the past four years we’ve grown a tremendous network of cities and partners. We, together, have published approximately 30 Resilience Strategies and funded and trained almost 80 Chief Resilience Officers. But that’s just a small part of the community that’s been involved. We’ve engaged 1,300 community groups in the creation of city Resilience Strategies; worked with over 100 Platform Partners that have pledged more than $230M to our cities; and helped our members raise over $535M for resilience projects.

Cities have realized the value of this work, deciding to institutionalize and expand their resilience offices. To match their passion, we’ve greatly expanded how we can support them. We’ve opened offices on four continents, we’ve created dozens of new tools, and we’ve brought hundreds of subject-matter experts into our orbit. When we first began, the importance of cities to the 21st century was gaining recognition, but urban resilience, and the urgent need to develop it, was not at the forefront of conversations about our global future. Today it is.

Our cities and partners are moving from planning for urban resilience to building it. We are partnering with cities on inspiring work on the ground in their communities—work that is having an impact now, and work that will help shape cities into the future. This work is the focus of this report. As we welcome nearly 500 urban resilience practitioners from around the world to our Global Summit in New York City, we want to make a clear statement on our collective impact, and the world-wide implications of this movement we’re building.

So enjoy it. Relish the work you’ve done and the things you’ve accomplished. And then go redouble your efforts!

Best,

MICHAEL BERKOWITZ
PRESIDENT, 100 RESILIENT CITIES,
PIONEERED BY THE ROCKEFELLER FOUNDATION
WHY CITIES?

We are living in the century of cities. By 2016, more than 55% of the world’s population was living in urban areas, a proportion due to reach 70% by 2050. Cities are not only the environments in which a majority of us live, they are also the foci of the world’s economy, generating a full 80% of global GDP. But the impacts of climate change, aging infrastructure, population growth and mass migration, and social and economic inequity, are all disproportionately borne by cities today. As important political centers, and magnets for both our world’s richest and our most in need, cities stand at the forefront of the challenges and opportunities of the 21st century.

These global pressures affect individuals and systems in the cities where they live. While presidents and prime ministers slowly navigate national and international politics to reach a consensus on solutions, mayors and city leaders do not have the luxury to do so – they must meet the day-to-day needs of their residents, and ensure any investment returns tangible benefits. Increasingly, cities are also leading where national governments fail to, whether because of political intransigence, the complexities of their scale, or regressive policies that prey on fear and xenophobia.

The strategies cities create for their futures, and the decisions they make on what to prioritize, will reverberate globally, with the potential to affect the lives of billions of people.
WHY CITIES?
WHY URBAN RESILIENCE?

Three converging trends have come to characterize the 21st century: urbanization, globalization, and climate change. The world has grown more urban, more integrated, and with a greater number of people at risk than ever before. These conditions require new models of governance. From extreme weather events to refugee crises, from disease pandemics to cyber-attacks—business-as-usual models of reactive planning and siloed decision-making will not engender the fundamental strength and flexibility essential for us to thrive in the 21st century.

Building urban resilience, defined as “the capacity of individuals, communities, institutions, businesses, and systems within a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience,” will allow cities to prosper in the face of these challenges, helping them to prepare for both the expected and the as-yet unimagined. Acute shocks are sudden, sharp events that threaten a city, such as earthquakes, disease outbreaks, or terrorist attacks. Chronic stresses, such as high unemployment, overtaxed or inefficient public transportation systems, or chronic recurrent flooding, weaken the fabric of a city over time and exacerbate shocks when they inevitably occur.

Of course, the challenges cities face are rarely just one discrete shock or a lone stress, but rather interconnected combinations of both. A well-known example is Hurricane Katrina, which hit the southeastern U.S. in 2005 with devastating consequences. It wasn’t the force of the wind or the rain alone that caused such a crisis in the city of New Orleans, where nearly 1,000 people were killed and US$135 billion-worth of damage was suffered. The storm’s impact was greatly exacerbated by stresses like institutional racism, violence, aging infrastructure, poverty, poor macroeconomic conditions, environmental degradation, and other chronic challenges. The compounding pressure of these unaddressed stresses undermined the city’s resilience. When a terrible shock hit, it exposed and exacerbated structural weaknesses, ultimately making it far more difficult for the city to bounce back.

Paris offers another example of the need to plan holistically, so that a city is prepared for whatever shocks and stresses may arise. When Paris sought to join the 100 Resilient Cities network in 2014, it focused on its vulnerabilities to flooding and heat waves. Given the risk posed by the Seine overrunning its banks, as well as the legacy of the tragic 2003 heat waves, in which over 700 people died, these priorities were appropriate for Paris at the time, and remain important risks faced by the city.

However, since 2015, Paris has seen a dramatic increase in migration—50 to 60 migrants arrive in the city daily, most of them asylum seekers, fleeing conflicts in Africa and the Middle East. As a result of this unforeseen population shift, migrants now compose a majority of the unsheltered homeless population in Paris, complicating the city’s ongoing struggles to accommodate and integrate its most vulnerable residents. That same year, the world watched as the horrific...
events of Charlie Hebdo and the November attacks unfolded amidst this confluence of stressors. Recovering from those coordinated terrorist attacks, which claimed over 130 lives, Paris realized it had to reorient its concerns toward more holistic strategies for strengthening the city, ones that would build inclusive, cohesive, and prepared communities. Furthermore, it saw that the solutions that could help it solve for heat waves and flooding could also be designed in a way that responds to its social challenges.

Resilience thinking demands that cities look holistically at their capacities and their risks. This isn’t easy work. The current approach to urban development is a siloed one, with one team designing disaster recovery plans, another team exploring sustainability issues, another focused on livelihoods and wellbeing, and yet another on land-use planning and infrastructure. That may be an efficient way to structure the work of a city, but it is not the most effective way. Cities are systems, not silos. As the examples of Paris and New Orleans illustrate, planning for a resilient future necessitates tackling challenges and creating solutions in an integrated, inclusive, risk-aware, and forward-looking manner. Doing so will allow cities to enjoy the multiple benefits, or “resilience dividend,” that such solutions offer.
WHY 100 RESILIENT CITIES?

The Rockefeller Foundation has been a leader in urban policy since the late 1950s when it launched an Urban Design Studies program. One of its first grants was to a then-obscure author for the research and writing of The Death and Life of Great American Cities. More than fifty years later, Jane Jacobs’ book remains one of the most influential works ever written on urban design, and it laid the foundations for urban resilience.

In 2013, building on this long tradition, and in celebration of its 100-year anniversary, the Rockefeller Foundation launched 100 Resilient Cities (100RC), a non-profit dedicated to helping cities around the world become more resilient to the physical, social, and economic challenges of the 21st century. Our mission is to catalyze an urban resilience movement, and we have rapidly built a dynamic global organization.

We work along four key pathways in pursuit of our mission:

1. CITY ACTION: We partner closely with cities to help them take practical action toward building their resilience. We work with them to hire a Chief Resilience Officer (CRO), to create a holistic Resilience Strategy in collaboration with a wide range of community stakeholders, and to implement the actions designed in that strategy. We provide funding, capacity building, technical assistance, and access to a wide array of resources that help cities take action to implement resilience solutions and institutionalize resilience thinking.

2. RESILIENCE SOLUTIONS: Cities often lack access to the tools or technical assistance they need to design and implement solutions to their resilience challenges; sometimes they don’t even know what kind of support they need. We have built a diverse Platform of Partners, including global industry leaders and innovators from the private and non-profit sectors, to respond to cities’ demands and support them in taking action. We connect cities to Partners who have the solutions and expertise they need, and help catalyze the marketplace to create new solutions where necessary.

3. LOCAL LEADERS: To catalyze a resilience movement, local leadership must serve as champions, galvanizing support among stakeholders and residents. We have developed a peer-to-peer Network through which Chief Resilience Officers and other local leaders receive trainings, share best practices, and collaborate on solutions. These leaders are the vanguard of a new urban resilience practice, and are crucial ambassadors advancing the global movement.

4. GLOBAL INFLUENCE: In order to catalyze an urban resilience movement, global organizations with the capital, power, or regulatory authority to dramatically impact urban challenges must be committed and engaged. By proving the value of resilience solutions, 100RC seeks to inspire and influence global thought leaders, policy makers, and financial institutions to incentivize and fund resilience building efforts—in our member cities and around the world.
100RC OPERATES IN:

| 6 CONTINENTS | 48 COUNTRIES | 21 LANGUAGES | CITIES WITH POPULATIONS FROM 40K TO 21M |

100RC’s diverse and dynamic network of cities is facing a common set of shocks and stresses. Member cities face rainfall flooding, infrastructure failure, earthquake, extreme heat, and disease outbreak as their most common shocks, and aging infrastructure, a lack of affordable housing, inadequate public transportation, environmental degradation, and economic inequality as their most common stresses.

CATALYZING A MOVEMENT TAKES TIME, AND OUR VISION FOR CHANGE IS MULTI-GENERATIONAL. HOWEVER, IN THE LAST FOUR YEARS WE HAVE ALREADY SEEN THE FOLLOWING SUCCESSES* ALONG OUR FOUR PATHWAYS FOR IMPACT:

**CITY ACTION** - Designing and implementing actions and initiatives that will transform the future of member cities:
- **30 holistic Resilience Strategies**, with over 1,600 concrete actions and initiatives
- **13,000+ members** of community of practice, working on urban resilience

**RESILIENCE SOLUTIONS** - Connecting and catalyzing key global partners to deliver value and innovate solutions in member cities:
- **138 collaborations** between partners and cities to address city challenges
- **$230M in pledged support from Platform Partners**

**LOCAL LEADERS** - Building the capacity of resilience practitioners to deliver in their cities and champion the practice:
- **80 CROs** hired and trained to lead their cities’ resilience efforts
- **10,500 hours of resilience capacity-building** delivered to CROs

**GLOBAL INFLUENCE** - Influencing global actors to incentivize funding for resilience projects and promote the resilience practice:
- **$535M+** leveraged from national, philanthropic, and private sources to implement resilience projects in member cities
- **1,750 key media citations** of 100RC’s work and thought-leadership

* These figures are current as of July 1st, 2017. For up-to-date information, please visit our website: www.100resilientcities.org
WHY PARTNERS?

Mexico City, Mexico
WHY PARTNERS?

Partners are critical to our mission of catalyzing a global urban resilience movement. Diverse sectors, including private corporations, local and international non-profits, academia, and central governments, all offer services or expertise that can benefit cities as they try to solve some of their most entrenched problems. Cities often don’t know the tools or resources they need, and the market doesn’t always know how to support cities’ integrated resilience building approaches. Partners and investors from across sectors will be essential to bridging the gap between cities’ current capacities and what they need to thrive in the 21st century.

The 100RC Platform of Partners, with more than 100 members, begins to bridge this gap by communicating city demands to the marketplace of both mission- and profit-driven service providers, and granting member cities direct access to these powerful collaborators around the world. By connecting cities to a wide range of Platform Partners, we are helping catalyze innovation for resilience-building solutions.

This report highlights numerous examples of how 100RC Partners and member cities are working together to develop new solutions to urban resilience challenges, and profiles some of our Partners’ service offerings.
TAKING ACTION
URBAN RESILIENCE INITIATIVES
The development of a Resilience Strategy is a hallmark of 100RC’s partnership with cities. The Strategies articulate a city’s long-term challenges, vision, and priorities, as well as specific initiatives for implementation that will have a positive impact on the lives and livelihoods of citizens.

100RC created a unique Resilience Strategy development process to help cities, partners, and citizens understand and address their shocks and stresses in a comprehensive way, and develop a series of actionable initiatives that will make their cities stronger and better able to adapt, thrive, and grow. Perhaps most importantly, the Strategy development process itself helps the city build resilience by entrenching a practice of integrated, inclusive, risk-aware, and forward-looking planning.

The process is led by a city’s Chief Resilience Officer, a senior municipal official tasked with breaking down silos and helping transform how cities understand their risks and plan for the future. To-date, 100RC member cities have appointed nearly 80 CROs around the globe. These diverse and dynamic leaders represent the vanguard of the resilience practice and are driving change in some of the world’s most complex cities. 100RC typically provides seed funding for this position for just two years, with the goal that doing so will catalyze longer-term change.
Thus far, nearly all of our cities have continued to fund and institutionalize their CRO offices after the 100RC grant period, proving the CRO’s office to be an integral part of city government in the 21st century and in building the capacity of cities to prepare for the future.

Another core component of the 100RC Strategy development process is our member city Network, comprised of all our global CROs. Not only does the Network allow our cities to cross-pollinate best practices and new ideas, but by having 100 disparate cities around the world adopt a common Resilience Strategy development process and CRO role, we are creating a shared language and experience base, and building a cohesive global practice of resilience. The Network enables different cities, partners, and other practitioners to inform each other’s work, solve problems collectively, and catalyze further action.

Deep and meaningful dialogue with citizens and stakeholders is a critical aspect of creating a Resilience Strategy. Too often, the voices of residents, especially the most vulnerable, aren’t integrated into city actions. Because the poor and vulnerable are also often disproportionately impacted by shocks and stresses, their perspective must inform the creation of the policies and programs that will affect them. To date, our cities have engaged more than 1,300 local community groups in the resilience planning process, ensuring citizen voice in and ownership of the resilience agenda.

In Boston, CRO Dr. Atyia Martin embarked on a monumental campaign of stakeholder engagement to inform the city’s Resilience Strategy, including by riding on city buses and interviewing passengers. Overall, her office engaged with nearly 12,000 residents, on topics ranging from racial equity to housing affordability to mental health to the impacts of climate change. Her commitment to gathering insights from the community led to the Strategy’s unique emphasis on racial equity as integral to the city’s future development.

In sum, a Chief Resilience Officer, a Network of member cities, a Platform of Partners, and a foundation of community engagement are all key elements of the 100RC process. The Resilience Strategy development process creates new insights, partnerships, and approaches, and entails a holistic analysis of a city’s capacities, strengths, weaknesses and risks. The connections created during the process will raise awareness, spur investment, stimulate new tools, partnerships, and financing for implementation in each city, and collectively catalyze a global movement to build urban resilience.
The more than 30 Resilience Strategies published by 100RC member cities so far contain more than 1,600 action-oriented initiatives – from discrete social programs to ambitious infrastructure projects, running on timescales from a few months to multiple generations. These cities are already hard at work implementing these actions, and thus far have leveraged more than US$535M in external funding from private, public, and philanthropic sources to that end. This is just the beginning of what we expect to be significant investment in urban resilience efforts over the next decade and beyond.

The actions in the Strategies are a blend of ongoing work, recognized for its resilience value, as well as new ideas generated by the Strategy development process. Analysis of these Strategies reveals a growing resilience movement – our cities are creating Strategies in different contexts around the world that nevertheless share many common goals and bring a holistic understanding to their methods for tackling similar challenges.

While all of our cities have created actions around mainstreaming good governance, institutionalizing resilience, improving sustainability, and managing key city services, we also see the influence of regional conditions and unique city characters, with African cities more focused on energy and waste management, the Asia-Pacific region honing in on disaster preparedness, Latin America more likely to target social cohesion, Europe innovating around urban design, and North America prioritizing socio-economic equity.

This report focuses on some of the ways cities are now taking action, looking closely at the following seven projects, and illustrates how resilience thinking can maximize the impact of a city’s efforts and ensure each project returns multiple benefits for residents.
1. Boston is incorporating racial equity goals into its plans for extending its metro transit system.

2. Medellín, together with Platform Partner Build Change, is protecting informal communities from landslides while improving social cohesion among residents.

3. Melbourne will create a cohesive strategy for managing urban forests across its many jurisdictions, to take full advantage of the multiple benefits offered by healthy natural assets.

4. Surat will address its twin problems of insufficient water quantity and quality through comprehensive and inclusive planning that combines place-based interventions with programmatic elements and community engagement.
5. New Orleans is developing new systems for flood protection by systematically considering the challenges and opportunities of an entire district, to build resilience at the neighborhood scale.

6. New York is exemplifying the ethos of “build back stronger” in a highly vulnerable community still severely damaged by Hurricane Sandy, by incorporating goals of economic inclusion and quality-of-life improvements into its disaster recovery planning.

7. Mexico City is deploying innovative finance to meet the basic water needs of its vulnerable populations in a manner that will also protect its ecosystems and boost its resilience to climate change.
Along with those seven projects this report highlights 33 additional projects across 25 more member cities around the globe which are working on similar resilience challenges. All of the efforts included here are in or near implementation, and will continue to evolve as our member cities and their partners learn and iterate on this work.

If you are interested in learning more, or in getting involved in these projects, please contact 100RC.
Boston has designed a major transportation project that addresses gaps in economic and racial equity, thereby better integrating vulnerable communities into the economy and life of the city and making it stronger and more resilient against future shocks and stresses.

From gondolas overhead to subways underground, from ferries to bus-rapid-transit to self-driving electric cars, new modes of transportation can have profound effects on a city. Likewise, insufficient mobility systems have reverberating impacts through the economy, neighborhood fabric, environmental health, and social cohesion of a city.

In 2014, 64% of all travel took place within urban environments, and the total number of urban kilometers travelled was expected to triple by 2050. Also in that year, 157 cities around the world had a metro system in operation, with 53 of those systems constructed in the years since the turn of the millennium. Five of the busiest metro systems in the world are found in 100RC member cities, with the combined annual ridership of London, New York, Seoul, Mexico City, and Paris topping 10 billion trips. Meanwhile in African cities, walking still accounts for up to 70% of all trips taken, placing even greater import on the distances between necessary services for citizens.

No matter the mode of transport, urban mobility sits at the confluence of a number of major trends, from population growth and shifting densities, concerns for health, air quality, greenhouse gases, and energy prices, to the increasing social and economic stratification of neighborhoods. Therefore, incorporating resilience into transportation planning and projects large and small has the potential to create change across a broad range of city systems.

To achieve this, 100RC member cities are designing transportation interventions that consider more than simply moving people from place to place, as member city Boston currently exemplifies. The cradle of American democracy, the city of Boston boasts storied academic institutions and a history of civic engagement. However, it also leads all large American cities in income inequality, broken down starkly along racial lines; the median net worth of a white family in the Metro Boston area was US$248,000 in 2016, while that of an African American family was a meager US$8,000.

To address this and other gaping inequalities, the city has made racial equity central to its Resilience Strategy. Several of its transportation initiatives directly target racial and economic inequities and serve to complement the city’s transportation plan, Go Boston 2030. In Boston, non-white families use public transit more frequently, relative to their populations, and experience longer commutes to work – 46 minutes on average, compared with 39 minutes for whites. In addition, Boston neighborhoods with high concentrations of people of color suffer from the highest transportation costs.

The city therefore set a target of reducing the commute times of average Bostonians overall by 10%, and those of communities
of color by 15%, along with seeking ways to reduce their cost burden. While this disparity is borne by Boston’s communities of color daily, the snowstorms that paralyzed the city in 2015 exposed its severity. Not all Bostonian communities felt the damage of the storms equally. Non-white communities were far more isolated and their residents more financially devastated by being unable to get to work.

As a result, several of the city’s transportation projects will therefore serve to better connect communities of color to job centers and make their commutes shorter and more reliable. They include changes to current bus routes and an expansion of the metro line. One project – the extension of the Fairmount/Indigo metro line service – holds particular potential. The city has identified that line as a key corridor for reducing inequality for underserved communities of color, capable of paying dividends in terms of economic opportunity, neighborhood vibrancy, and education. Due for completion by 2021, the extension of the Fairmount/Indigo line will bring regular rail service to within a 10-minute walk of an additional 1,200 households via three new stations. The project also consists of service improvements and conversion to high-speed rail service, both of which encourage residents to switch from driving to sustainable mass transit. According to the city’s Resilience Strategy, “No longer a commuter rail line, urban rail will interconnect the heart of Boston’s neighborhoods and create new direct access to Boston’s biggest employment and commerce centers.”

One of the four visions of the city’s Resilience Strategy is to create a “Connected, Adaptive City,” by increasing “the connectivity of communities of color while adequately preparing for threats to infrastructure used by all Bostonians.” The first goal within this vision is to “develop a redundant and reliable public transportation network to provide equitable accessibility for all Bostonians.” As a first step, the CRO’s office is partnering with key city departments to advance the business case for the Massachusetts Bay Transportation Authority (MBTA) to invest in the Fairmount/Indigo Line as a way to meet the city’s growing transportation needs and address longstanding transportation inequities. By creating greater opportunity for underserved communities of color, and fostering social cohesion, Boston will strengthen itself as a whole, better preparing it for the next paralyzing storm or other shocks it may endure.

**SPOTLIGHT ON PLATFORM PARTNERS:**

**URBAN MOBILITY**

The Institute for Global Environmental Strategies: Analysis of air quality and climate change co-benefits of transportation plans

The Institute for Global Environmental Strategies (IGES) is a Japan-based non-profit that works with cities and their partners to identify transportation plans and policies that can limit greenhouse gas emissions, improve air quality, decrease traffic congestion, and improve public health. IGES assists member cities with determining which kinds of transport interventions offer these kinds of co-benefits and to what extent.
ACROSS THE NETWORK: URBAN MOBILITY

100RC cities have published over 100 transport and mobility-related actions in their Strategies, many of which address inequity as a central concern.

- **BRISTOL** is seeking to extend free travel on public buses to all children under the age of 16, regardless of where they live or attend school. In addition to meeting the needs of its youngest citizens, this approach is designed to create life-long users of public transit. Moreover, the city is augmenting its current 20-year transportation plans with 50-year scenarios around “radical interventions to reduce congestion and carbon emissions, and ensure infrastructure is resilient to climate change.”

- **BYBLOS** is working to synthesize its various transport-related programs and research into an integrated mobility plan that will focus on improving walkability and the interconnectedness between neighborhoods in order to address disparities between the older parts of the city and the wealthier, modern areas.

- **MELBOURNE’S** modern, multi-modal transportation network has not kept pace with its rapid growth. To address this, the city is working with Platform Partner CityMart to run a challenge seeking “creative, feasible and impactful ideas to address these complex and connected issues, and bring new thinking to address the challenge problem: to help reduce transport congestion, and/or make the experience of travel more socially fulfilling, thereby making an important contribution to our city’s resilience.” The city received 96 submissions and the winner will be announced at the end of July 2017.

- **QUITO** is in the early stages of building Ecuador’s first metro system, one of the largest infrastructure projects in the country’s history. Through the efforts of the city’s CRO, the city has now secured funding from the IDB to create resilience-value studies that go beyond the traditional engineering, environmental, and economic impact reports conducted for such a project. Through this funding, the city is designing a comprehensive analysis of the new system’s potential effects on social cohesion, long-term environmental sustainability, and land value capture.

- **SEMARANG** has devoted several initiatives to better integrating its mobility systems. With the support of Platform Partner IGES, the city conducted a study to develop scenarios for transport interventions that will yield multiple dividends, including emission reductions and public health benefits. Next, Semarang and IGES will be conducting a study on modal shift possibilities for the city’s bus system, and eventually the city may look at other options including expanding coverage to corridors and feeder services, dedicating certain routes and buses specifically to students who do not at the moment have their own transportation to school, and exploring plans to implement a tariff for intermodal public transport.
INTEGRATING INFORMAL COMMUNITIES
Medellin is Making Housing Safer and Building a Culture of Inclusion

Medellin is collaborating with slum residents on housing retrofits to improve their living conditions, better incorporate them into the rest of the city, and mitigate the city’s exposure to the risk of landslides and earthquakes.

Rapid urbanization has led to an explosion of informal settlements across the world, especially in the Global South. Today roughly one billion people live in such communities, often called slums. With over 90% of global urban growth occurring in developing countries, and 70 million more people being added to cities in those regions each year, the population of informal communities is expected to soar.12

The UN defines slum households as having one or more of five “deprivations,” including lacking sufficient access to water, sanitation, living space, land tenure, and structurally sound dwellings. Informal settlements are frequently associated with high rates of crime, disease, and extreme poverty. And yet they are often also remarkable examples of community ingenuity and resilience, with residents working collaboratively to supply basic services, including sewage, waste collection, education, and housing to support the needs of their families and neighbors.

While Medellin is often hailed for its amazing resurgence, it still struggles with informal communities and other legacies of its tumultuous past. In 1988, Time Magazine called it “the most dangerous city in the world,” with its sprawling slums central to that designation. From 1951 to 1973, Medellin tripled in size, to over one million people.

That population growth coincided with other chronic stresses, such as poverty, poor planning, and insufficient infrastructure. These factors drove the most vulnerable residents to build illegal houses on the precarious hillsides around the city, prone to landslides and far removed from the commercial center of the valley floor and the basic services offered by the city. The drug trade filled this vacuum, and soon controlled much of the city. In 1991, 6,349 people in Medellin were murdered – 17 people per day.

Since 1991, the homicide rate has decreased by 95%. Between 2002 and today, the poverty rate fell by 22.5%.13 Medellin achieved this via a concerted effort by numerous groups within and beyond the city government that together systematically considered Medellin’s challenges—crime, poverty, lack of social services, disparate communities, lack of opportunity—as interconnected. Most notably, the city built an innovative public transportation system that connected disenfranchised communities to the rest of the city, dramatically reducing commute time and congestion, boosting social cohesion, and offering greater economic opportunities. The city was truly a pioneer of urban resilience.

However, the city still contends with the informal communities surrounding the city, which continue to expand despite their risk of landslides. Medellin today has turned away from past policies that focused only on slum clearance, and toward more humane and ultimately practical investments in upgrading and formally incorporating the communities. As part of its resilience work with 100RC,
Medellín acknowledged that the security of these communities is inextricable from the city’s overall ability to thrive. The city is therefore pursuing programs that support better home construction while also strengthening residents’ capacity and investment in their communities. In conjunction with 100RC’s Platform Partner Build Change, an organization that supports cities’ efforts to improve building safety through seismic retrofits, Medellín is taking concrete steps to secure its slums by reducing their vulnerability to earthquakes and landslides, and developing local skills.

In seeking to address this challenge, the partners realized that the path to a solution required making changes at the national level. Therefore, Medellín’s Resilience Office worked with Build Change to create a manual that establishes the technical procedures and guidelines for retrofitting houses for earthquake resilience throughout
Colombia. The National Association of Seismic Engineering approved those guidelines, thereby allowing them to be applied nationally and adopted by any municipality.

The Medellin Secretariat of Planning not only approved the guidelines for the city, but also provided financing to pilot the retrofits on 50 homes. The city is now working with the World Bank to secure the resources to expand that pilot to thousands of hillside households in the coming years. The seismic retrofits program empowers communities themselves to complete the work, in order to bolster the local economy, improve community risk management and awareness, and foster a greater sense of community ownership among homeowners and local builders. Build Change is now training local builders in the communities alongside of the city’s engineers and contractors in the necessary building techniques and methods to evaluate and retrofit the houses.

In the long term, the program is designed to educate and empower homeowners in Medellin’s slums and connect them to federal government subsidies that were created following a major earthquake in the 1990s (available for up to 21x minimum wage or approximately US$7,000) to carry out seismic retrofits. Currently, the subsidies are well-known only as a way to carry out kitchen or bathroom upgrades and cosmetic improvements, but when paired with community outreach and incentives they offer a path to accelerating these important risk reduction efforts for informal settlements.

Along with the multiple benefits accrued to the families in each retrofitted home, a critical mass of retrofits will lower the risk to the city as a whole of facing significant economic losses and causalities as a result of a major seismic event or landslide.
what3words: Location Reference and Address System

Being able to clearly communicate location is essential to building a resilient city. what3words (w3w) can help provide member cities and their citizens with a specific fixed address for locations that do not otherwise possess traditional addressing systems, such as informal settlements, or parks and open spaces. what3words maps locations by creating a global grid of 57 trillion squares with a unique three-word address for every 3x3m square. The company works with city-specified departments to integrate their Application Programming Interface with any existing city address management systems. The service enables previously unmapped slum residents to better integrate within their communities through improved social mobility and within their cities through improved access to basic civic and social services, and overall enables city residents and businesses alike to benefit from reduced risks and increased economic opportunities.
ACROSS THE NETWORK: INFORMAL COMMUNITIES

Many of 100RC’s member cities have large populations of informal communities. Including Dakar, Durban, Lagos, Medellin, Mexico City, Porto Alegre, Quito, Rio de Janeiro, Santa Fe, Surat, and more.

• **BANGKOK** has a large population of vulnerable migrant workers who face poverty, dangerous working conditions, high risks for disease, and informal living situations, as well as significant exposure to flooding. The city’s Resilience Strategy includes initiatives that will assess the current state of migrants’ housing and workplace conditions, and spur official enforcement of existing codes and standards where employers or landlords are failing to comply.

• **DA NANG** is at a high risk of severe tropical storms and flooding, and less than half of the city’s residents live in what are classified as permanent homes. The city’s Resilience Strategy includes multiple actions that partner with the community to source finance and improve the technical capacity of local builders to retrofit such homes to be more resistant to severe storms, and to ensure that new homes are built according to best practices. Da Nang is also looking to pilot an insurance mechanism for disaster resilient housing, pending the introduction of new national legislation to promote the development of a residential housing catastrophe insurance market.

• **PORTO ALEGRE** has begun its resilience work by streamlining the process required to regularize land ownership rights for slum dwellers and to make additional land available for housing development. The city is now pairing this legislative work with public information campaigns, so that residents can better understand the laws and how to exercise their rights within them.

• **SANTA FE** has a substantial number of families living in informal settlements in untenable flood plains, and has been working to resettle them to less risky areas for nearly a decade. Through their resilience work, they identified gaps in previous resettlement efforts around community input and the provision of a wider range of social support services to the resettled families. For example, they found that many of the households in need of resettlement are headed by young mothers, who have struggled to finish their studies and find employment while also caring for their children. Therefore, the city now assigns a social worker to each family, who helps with skills training and job qualifications. Santa Fe is also setting up new city-run kindergartens to assist with childcare needs. Thanks to this recognition of the interdependencies between housing, education, crime, and families, these and other new tools and methodologies for greater inclusivity and service provision will be incorporated into resettlement programs going forward.
CITIES TAKING ACTION: NATURAL ASSETS

Melbourne, Australia
VALUING NATURAL ASSETS
Melbourne’s Urban Forests Will Improve Health and Wellbeing

Melbourne is leveraging the value of natural assets through a cohesive, metro-wide urban forestry and biodiversity strategy, that will reduce the city’s heat island effect, mitigate flooding, foster social cohesion, and improve public health.

Natural assets, also called ecosystem services or natural capital, is a term for the environmental resources that create benefits for human society, such as water and air quality, natural flood protection, biodiversity, and even soil and minerals. In 2011, the value of our planet’s total natural assets was estimated to be between US$135 and US$157 trillion per year. For perspective, the nominal Gross World Product in 2016 was only about half that, around US$75 trillion. Despite their significant value, both economists and policy makers have long struggled to accurately assess and incorporate the value of natural assets into their decision making. And while those global figures include non-urban natural assets, cities are likewise negatively affected by undervalued or degraded ecosystems.

Decades of development have eroded the natural assets of cities, literally paving over the critical conditions and ecosystems that made a city’s location an ideal place for human settlement in the first place. This degradation of natural assets forces greater reliance on costly man-made interventions to protect against resulting risks, such as building expensive sea walls to protects communities from storm surges that natural systems like mangroves used to manage.

Australia possesses substantial natural capital, home to some of the world’s most unique wildlife and the unparalleled Great Barrier Reef. Its urban areas likewise depend heavily on their environments. The nation’s second largest city, Melbourne is “a vibrant and proudly multicultural city of 4.6 million residents, originating from more than 180 different countries. A ‘city of cities’, Melbourne is made up of 32 local government authorities (councils) spread over 10,000km² around Port Phillip Bay, comprising hundreds of diverse local neighborhoods.”

Melbourne’s unique geography leaves it exposed to devastating disasters including extreme heat and bushfires, and sea level rise and flooding. In 2009, the city suffered a fire that killed 173 people and destroyed thousands of homes, with an accompanying heatwave that led to 374 additional deaths. As climate change increases both the frequency and severity of these types of events, the city today struggles with how to manage an expanding built environment against the loss of its natural assets.

Melbourne’s neighborhoods have developed with a wide range of population densities and a highly variable urban tree canopy; some of its 32 councils have the lowest tree canopy ratio in Australia. The city also contends with the “hardening” of once-arable land through rezoning for infill development and the development of new suburbs. The infrastructure built to keep pace with the sprawl has supplanted the vegetation that provided shade, absorbed the sun’s heat, and possessed a natural permeability adept at...
absorbing excess water; the many new roofs and roads cause greater destruction during flash floods and lead to more heatwaves.

These challenges were foremost in the minds of city leaders as they developed the city’s Resilience Strategy. In the past, greening projects took place piecemeal, without comprehensive coordination between local councils, and such efforts struggled to achieve the scale of impact the city requires. To better coordinate and create a standard for action, the first initiative in the Resilience Strategy document calls for the creation of a Metropolitan Urban Forest Strategy.

The Urban Forest Strategy will drive reforestation and natural asset development across the full metropolitan area, allowing the city to reclaim more of its natural biodiversity and the benefits it bestows. From a resilience perspective, a greener Metro Melbourne means shadier, cooler metropolitan areas, lower flood risk, and less storm water and damaging nutrients entering waterways and Port Phillip Bay. Furthermore, by aiming for a greener Metro Melbourne, the Urban Forest Strategy is expected to unlock further co-benefits for residents, including reduced obesity levels, better mental health, and more active lifestyles.

The first step in implementing this action is to create a compelling case for increasing biodiversity and urban forest cover in the city, and cultivate buy-in for the value of natural assets from a diverse range of stakeholders. To do this, the CRO’s office is collaborating with Platform Partner The Nature Conservancy to prepare a baseline assessment of metropolitan Melbourne’s biodiversity, as well as identifying financing options for implementation of the Urban Forest Strategy.

Platform Partners Digital Globe and Trimble are also supporting this baseline mapping. The city is actively inviting the participation and input of local councils, state government actors, and civic and research organizations in the development of its Urban Forest Strategy. Furthermore, the CRO’s office is building better knowledge and alignment across stakeholders on biodiversity through trainings and community meetings, including by forming a technical advisory group and a stakeholder reference group to enable a co-design process with state government, councils, and communities.
Finally, through a 100RC Network convening held in February 2017, CROs from five member cities (Boulder, Durban, Semarang, New Orleans, and Melbourne) met in Melbourne to investigate how to transform their cities through investment in natural assets, particularly biodiversity. As a result of this event, Melbourne has expanded its ambitions to explore the additional co-benefits of urban forests that link to biodiversity, including how investing in its natural assets could allow it to be more resilient to extreme weather events.
Earth Economics: Natural Capital Valuation Analysis and Consultation

Earth Economics is a U.S.-based non-profit specializing in “quantifying and valuing the benefits nature provides.” Earth Economics works with member cities to create a cost-benefit analysis of investment in the preservation of the city’s natural assets, and provides valuation tools that support critical natural capital initiatives such as watershed management or the stewardship of open space. Armed with this information, cities can quantify and communicate the actual monetary value of “free” services that nature provides to a city’s economy. Earth Economics trains city staff in natural service valuation, gathers and analyzes city data, assists in the effective communication of natural asset values, and provides recommendations for further action.
ACROSS THE NETWORK: NATURAL ASSETS

Cities around the world are reclaiming the environment’s potential as a natural building block of urban resilience. To date, member cities have developed over 130 initiatives related to protecting ecosystems and valuing natural assets.

- **ATHENS** is investing in its urban green spaces while also improving the effectiveness of municipal governance structures through its “Major Green Areas Managing Authority” initiative. To address the disparate authorities currently managing the city’s green spaces, Athens is strengthening coordination and creating new partnerships that will support strategic and sustainable management. In so doing, the city aims to maximize its natural assets and protect existing infrastructure, making spaces within the built environment more integrated, accessible, and appreciated, serving the city’s broader resilience goal of integrating natural systems into its urban fabric.

- **BRISTOL** is developing a public-private partnership opportunity to deploy a Payments for Ecosystem Services model to protect natural assets, such as forests and green spaces, in the city and across its wider region. The city will develop a high-level assessment of the financial value of its parks. In addition, the Natural Capital Trust will coordinate funds from developers and beneficiaries to enhance the resilience value of projects from infrastructure to climate change adaptation efforts, in order to improve well-being throughout the West of England.

- **DAKAR**’s green spaces have declined in the midst of rapid urbanization and increased city development, leaving only a few parks in the city. The city is investing in rebuilding its public green spaces to combat the effects of climate change and gain from the benefits to public health and community engagement they provide. Dakar will create a greener city through public-private partnerships that support the development of new parks and gardens, the conservation of biodiversity, and stronger enforcement of land use policies.

- **RIO DE JANEIRO** faces a range of interconnected environmental and health challenges including intense rains, sea level rise, and poor sanitation. Protection of the city’s natural assets is a critical priority for developing long-term resilience. To address water security and livability issues, the city is creating a “Public Authority for the Guanabara Bay” that will remediate and improve metropolitan governance of the Bay, in turn activating the Guanabara’s economic and recreational potential. In addition, the city has planned a project of “Arbored Squares” which aims to revitalize 78 public squares by planting 50,000 trees, thereby mitigating urban heat islands and ensuring a majority of the population has access to a green area within a 15-minute walk from their home.
By cleaning its main river and focusing on treating sewage at its source, Surat will ensure the long-term provision of clean drinking water, improve the river’s accessibility, enhance recreational opportunities, and restore the river’s overall ecosystems.

While water covers 70% of the world’s surface, only 0.3% of it is actually available for human use, as the rest consists of oceans or ice caps, or is trapped in the soil or the atmosphere. Today, over 50% of urban households lack sufficient access to safe drinking water. And urban water demand is anticipated to increase by 50%-70% over the next 30 years, with nearly 2 billion urban residents facing seasonal water shortages by 2050.20

In India, as recently as 2011, the World Bank found that less than 50% of urban households were connected to running water, that not a single city received piped water 24 hours a day, 7 days a week, and that much of the water they did have access to was not potable.21 The Indian city of Surat, an important port on the Arabian sea and economic capital of the state of Gujarat, is one of the fastest growing and industrializing cities in the world. Unfortunately, part of this rapid development has resulted in the pollution of the Tapi River, the heart of the city and the sole source of fresh drinking water available to the city’s 5.5 million residents, a population predicted to reach 8 million by 2020.22

The city has been piping water from the river for over 100 years. In 2015 the average demand was nearly 1 billion liters per day, and rapidly growing.23 However, the water supply is highly unreliable, averaging only three hours of running water throughout the city per day, with increasing levels of pollution and salt-water intrusion. To address this, Surat’s Resilience Strategy devotes several of its initiatives to remediating environmental damage and regulating water usage, in order to ensure sufficient clean water for its population over the long term, and to build stronger links between citizens and their river.

A city requires both sufficient quantity and quality of water. To help address its risks of insufficient quantity, Surat will deploy a four-pronged effort:

- Significantly expanding Smart Water Management with Intelligent Sensing technology (in its pilot phase, this technique demonstrated its ability to increase water supply by 30%). 24

- Going beyond state regulations mandating them for new construction to install rainwater harvesting units within existing government and institutional buildings, demonstrating such systems as best practice to commercial and residential building owners as well.

- Developing guidelines for closed-loop water reuse which will be first of their kind in India, and investing in and promoting anaerobic purification treatments for wastewater where appropriate.

- Leveraging an existing program that transfers water from water-surplus regions by cleaning its main river and focusing on treating sewage at its source, Surat will ensure the long-term provision of clean drinking water, improve the river’s accessibility, enhance recreational opportunities, and restore the river’s overall ecosystems.

By cleaning its main river and focusing on treating sewage at its source, Surat will ensure the long-term provision of clean drinking water, improve the river’s accessibility, enhance recreational opportunities, and restore the river’s overall ecosystems.
to water-deficit regions to campaign for the conservation of lakes and other water resources that could potentially be interlinked to bolster the river’s supply.

The Resilience Strategy pairs these actions with a focus on improving and maintaining the water’s quality and the overall health of the river’s ecosystem, by:

- Declaring the banks of the Tapi river and tidal creeks as environmentally sensitive zones, and conducting a comprehensive analysis of water quality data, with additional tests to update existing data on an as-needed basis.

- Monitoring commercial, residential, and industrial activities on a regular basis using instruments that test for specific pollutants and are equipped with GPS/GPRS capabilities to enable officials to map changes over time at key locations.

- Introducing a penalty system to discourage polluters, thereby generating additional revenue for the monitoring work.

- Potentially installing surveillance cameras at key locations that are linked to the smart city center.

- Checking treated effluents discharged into the river, and enhancing sewage treatment facilities and the incorporation of new cogeneration plants.

These place-based interventions will be carried out at the river’s edge across several Surat wards, in outlying upstream villages, and at outlets along the course of the river. In addition, capacity-building trainings will educate city staff about best practices for
measuring water quality. Finally, recognizing that technical and regulatory initiatives can fail without sufficient buy-in, the city will engage citizens in a multi-pronged outreach campaign about the relationship of their city with the river, and will develop a recreational green belt along both banks.
ACROSS THE NETWORK: WATER SECURITY

To date, 100RC member cities have designed more than 50 initiatives relating to water pollution and/or water security.

- **Amman** lacks ample natural resources and relies on imports to meet many of its basic needs, including water. Between 2011 and 2015, demand for water in the city increased by 40%. Amman is addressing water insecurity through the “Deliver Rainwater Harvesting Plan,” which will grow the city’s capacity to meet local demand, as recycling rainwater across sites like the King Abdullah II Park will improve conservation and resource efficiency. Concurrently, the initiative will raise awareness about the challenges of water scarcity and encourage more responsible usage.

- **Berkeley** is facing an increasingly drier environment as a result of climate change and accompanying periods of drought. Innovative methods to diversify the city’s water supply will be essential to ensuring sustainable conservation, particularly as dependency on declining snow pack levels has diminished the water supply. Some of these methods include a range of projects through partnerships with the local utility companies and UC Berkeley. For example, the potential to use groundwater for backup water supply or park irrigation is being explored, as is the option of using reclaimed water for street cleaning.

- **Byblos** is working to rehabilitate its main stream, Nahr Jaj, through stream daylighting, in order to better connect the newer and older sections of the city. The stream is an important part of the city’s heritage, but is currently culverted (buried) under the city’s roads. Its opening will also support better drainage and the development of an ecological corridor for city inhabitants. This initiative is furthering Byblos’ network of blue-green infrastructure and enhancing the health of the urban environment for its citizens and wildlife.

- **Da Nang** is a coastal city situated at the mouth of the Hàn River, and highly vulnerable to both floods and the impacts of water pollution. To address its risks, Da Nang has collaborated with its neighboring province, Quang Nam, to form one of the first cross-jurisdictional platforms in Vietnam for the co-management of a shared river basin. Historically, cities and provinces have acted independently, with Da Nang’s flood management system exacerbating flooding in Quang Nam, while the development of hydropower reservoirs in Quang Nam caused water shortages and increased salinization for Da Nang. The two will now create complementary watershed management strategies that will lead to economic development opportunities, more effective flood management and climate change adaptation, and increased water security.
SANTIAGO DE CHILE is a metropolitan area that includes both dense urban districts and rural zones. The rural areas suffer from unreliable supplies of potable water, with 2,500 houses still receiving water from tanker trucks. The city is undertaking a program to construct additional drinking water infrastructure and improve existing infrastructure. Moreover, they are conducting capacity-building exercises to create rural drinking water cooperatives that empower residents to administer this important service themselves, and equip them with knowledge of best practices for water management and new technologies which can further secure their water resources for the long-term.

Background Image: New York, USA

SPOTLIGHT ON PLATFORM PARTNERS:

WATER SECURITY

The Nature Conservancy: Urban Water Blueprint

The Nature Conservancy is a U.S.-based global non-profit dedicated to “addressing the most pressing conservation threats at the largest scale.” The organization operates more than 100 marine conservation projects globally, and has protected more than 117 million acres of land and 5,000 miles of rivers worldwide. One of its service offerings is the Urban Water Blueprint tool, the output of which is a comprehensive report and set of recommendations for water security based on an analysis of water in more than 2,000 watersheds and 530 cities. The recommendations consist of natural solutions that can be integrated alongside traditional infrastructure to improve water quality and protect a city’s water supply.
New Orleans, USA
New Orleans is creating a neighborhood model in its Gentilly District that addresses the interrelated risks of flooding and soil subsidence alongside the needs of a vulnerable community. Rather than just installing new water management infrastructure, the project also fosters economic development, empowerment, and social cohesion.

The resilience of a city needs to be built at many scales, ranging from the resilience of its regional economy to the resilience of individuals and families at a household level. Districts serve unique purposes and functions for distinct cultural communities or business or recreational activities.

Districts and neighborhoods have proven to be a critical scale for problem-solving, re-investment, and innovation in cities. Districts serve unique purposes and functions for distinct cultural communities or for distinct business or recreational activities. The different areas of a city may have different exposures to flooding, fires, and other natural hazards. They are also the scale at which most development occurs, often requiring special area plans. For all of these reasons, the implementation of city-wide Resilience Strategies will often need to be tailored district-by-district, neighborhood-by-neighborhood.

Many 100RC members, such as New Orleans, are already planning on the district scale. A 300-year-old city, home to one of the United States’ most unique cultural traditions and famed for its Mardi Gras celebrations, Hurricane Katrina devastated New Orleans in 2005, flooding 80% of the city and claiming nearly 1,000 lives. The lessons of the storm directly informed the resilience efforts of the city when it released its Strategy a decade later. As Mayor Mitch Landrieu wrote in that document, “it is safe to say that New Orleans has faced the biggest challenges any American city has ever faced. But New Orleans is a resilient place with resilient people. With resolve, determination, and commitment from the entire nation across public, private, and philanthropic sectors, we not only came back, but we are rebuilding New Orleans better and stronger than before.”

Rather than resisting its changing environment, the city has chosen to embrace it. Lying atop a river, surrounded on three sides by lakes and on the fourth by the Gulf of Mexico, the city has learned that it cannot see water as a force to battle against, but rather one to coexist with as a permanent feature of its urban landscape. In the process, New Orleans has become a model for other cities struggling with water management around the world.

One project that embodies this adaptive approach is the Gentilly Resilience District, a pioneering effort for the city. Launched in 2015 with a US$141M grant from the U.S. federal government, the project will introduce new water management systems across the residential neighborhood. It is designed to reduce flood risk, address soil subsidence and groundwater retention, shore up infrastructure, and foster community...
revitalization. Gentilly, with about 11,000 households, was chosen as the location for this project because of its low-lying land, multiple vacant lots, and because half of its residents are low- or moderate-income.29

The Gentilly Resilience District will pursue four distinct strategies:30

- Community Adaptation – engaging local residents about on-site water storage, storm-water management and home elevation for low- and moderate-income homeowners.
- Workforce Development – training underemployed individuals to build and maintain Gentilly Resilience District projects.
- Reliable Energy & Smart Systems – investing in diversified energy programs, energy redundancy at critical infrastructure sites, and a water-monitoring network to better manage subsidence and water quality with comprehensive data.
- Urban Water Infrastructure – building parks and on-street infrastructure that can accommodate excess water and complement the city’s system of pipes, pumps, and levees.

The Gentilly Resilience District combines many small projects with various approaches to water and land management under these strategies, which, when implemented together, will set a precedent for the city and exemplify the potential of integrating district-wide resilience thinking into city design, planning, and budgeting.
TAKING ACTION: RESILIENT DISTRICTS

Mirabeau Water Gardens, New Orleans, USA
ACROSS THE NETWORK: RESILIENT DISTRICTS

Many 100RC member cities are pursuing similar work, developing initiatives and other efforts that focus on a certain district.

• **GLASGOW** has selected the north part of its city as a “resilience exemplar” district, where they will implement an integrated resilience planning approach. The communities in this area share several stresses arising from the city’s post-industrial legacy. To address its concerns in an integrated way, the Glasgow North program aims to elevate social resilience by undertaking the development of extensive green space, district heating schemes, and investment in smart technology, as well as risk assessment mapping and capacity building, all through a lens of inclusive growth and equity.

• **GREATER CHRISTCHURCH** has devoted an entire goal of its Strategy, “Securing Our Future in Eastern Christchurch,” to specifically addressing the needs of that district. Eastern Christchurch faces “a range of challenging socio-economic issues including poorer educational attainment, below average incomes, higher levels of people on state benefits and poor quality social housing. The 2011 earthquake hit this area the hardest, causing damage so severe that the government had to step in and buy nearly 7,300 homes.” The district is also at risk of inundation from sea level rise and further seismic events. The resilience effort will focus on generating multi-party collaborations which will begin by conducting baseline needs assessments and risk analyses of the area, and progress to developing solutions capable of truly addressing these intertwined challenges and regenerating the district.

• **LOS ANGELES’** river is mostly familiar as a concrete-covered infrastructure project featured in many iconic movie scenes. Designed nearly a century ago for flood control, it has had a corrosive effect on the communal and ecological systems that surround it, causing habitat fragmentation, the erosion of biodiversity, and diminished access to open space and natural resources for the people and animals living along its corridor. The city is now working to revitalize the L.A. River district with a range of interdependent initiatives for environmental restoration that all have social cohesion and equity co-benefits at their core.

• **PITTSBURGH** has launched a first-of-its-kind Ecoinnovation District, which combines the goals of two existing models for building district-scale resilience in use around the country - the focus on bottom-up planning for sustainability of Eco Districts, and the focus on job growth and economic opportunity of Innovation Districts. The Ecoinnovation District will be implemented in the Uptown and Oakland neighborhoods, and represents “an opportunity to identify the ways in which redevelopment can improve the environment, support the...
needs of existing residents and expand entrepreneurship and job growth.”32

• **PORTO ALEGRE** has devoted multiple initiatives in its Resilience Strategy to the revitalization of its 4th District. This 892-hectare zone suffers from blight and depressed economic opportunity, and lies in a strategically central location for the city as a whole. The city plans to invest in new technologies, with a focus on attracting a strong health-services sector grounded in advanced ICT-capacities. The city is making these investments in the 4th District in ways which will ensure the productive inclusion of district residents, particularly the poor and vulnerable, and disenfranchised youth.

• **VEJLE** is using the area of Fjordbyen as a laboratory for climate change adaptation and flood control, where they will improve water management by exploring innovative and integrated solutions such as retrofitting new public spaces, in order to encourage economic growth while reducing risk. They will specifically highlight the neighborhood of Østbykvarteret as a best practice demonstration of how flood management interventions can have recreational values for their communities, to encourage citizens to embrace the ethos of “living with water.”

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**SPOTLIGHT ON PLATFORM PARTNERS:**

**RESILIENT DISTRICTS**

**Siemens:**

**Infrastructure Opportunity Assessment for Transport, Energy, and Buildings**

Siemens, the industrial manufacturing conglomerate, works with cities to develop an Infrastructure Opportunity Assessment (IOA) Report with recommendations for delivering a higher quality of life for residents through improved infrastructure. The IOA is meant to provide city managers with an understanding of the required infrastructure for both private- and public-sector partners working with the city on a respective project. The report will also provide cities with greater knowledge on specific technologies best suited for local infrastructure and for improving energy efficiency and reducing carbon emissions. This type of study can be tailored to the needs of a specific district, and, when combined with participatory community needs assessments and other stakeholder engagement, can lay the grounds for resilient planning.
CITIES TAKING ACTION

TAKING ACTION: DISASTER RECOVERY

New York, USA
RETHINKING DISASTER RECOVERY
New York is Tackling Social and Economic Vulnerability as it Recovers from Superstorm Sandy

Rather than restoring the hurricane-battered neighborhood of Edgemere to its pre-storm conditions, New York City has developed a comprehensive plan to strengthen this isolated and underserved community and ensure it is less vulnerable in the face of future challenges.

Natural disasters are occurring with greater frequency and severity as a result of climate change, while expanding population centers put larger numbers of people and assets at risk in each event. Between 2004 and 2014, worldwide direct losses from natural disasters were estimated at US$1.4 trillion. But a single disaster striking a major metropolitan area can have outsized impacts. A 2014 analysis of the risks faced by 616 cities by Platform Partner Swiss Re found that, as major cities tend to develop along natural waterways, flooding threatens more people than any other natural hazard, followed by earthquakes, storm surges, and strong winds. While a disaster may strike many residents at once, it is most likely to have lasting effects on the poor and vulnerable who lack the means to adequately prepare or rapidly recover.

The metropolitan area of New York is home to over 23 million people, and responsible for a full 8% of the economic output of the United States. In 2012, Hurricane Sandy collided with the Eastern Seaboard, including New York, causing 160 deaths and US$71 billion of damage, and leaving tens of thousands homeless across the region. It destroyed over 300,000 housing units in New York City, many of which were home to economically disadvantaged households. While Sandy was only an average hurricane when measured in terms of its wind force, its path brought it into contact with large numbers of people and major global assets, and the breakdowns in critical infrastructure it triggered resulted in massive destruction.

One of the hardest-hit neighborhoods in New York was the waterfront majority-minority community of Edgemere, on the Rockaway Peninsula in Queens. Shoehorned between a defunct landfill and a 20-block-stretch of city-owned empty lots, Edgemere has long been one of the most isolated and underserved neighborhoods in the city, with high numbers of its 6,600 residents living in poverty. Further weakened by the 2008 economic crisis, Hurricane Sandy struck an especially vulnerable community with many abandoned, structurally unsound buildings and more than a few remaining dirt roads; weak infrastructure which suffered severe damage when the neighborhood was completely flooded by the storm. Given the limited resources of its residents, Edgemere struggled to recover – 30% of property still lay abandoned three years later.

In 2015, the city of New York, led by its Department of Housing Preservation and Development, and in collaboration with its Resilience Office, launched the Resilient Edgemere Community Planning Initiative, a collaboration between the city, community members, elected officials, and local organizations. The program aims to achieve multiple social and economic benefits as it helps the community adapt to sea level rise and prepare for the likelihood that Sandy
will not be the last severe storm to batter the Rockaway shore. Much of the blight in Edgemere is on city-owned land, which presented an opportunity to pair the city’s recovery efforts with a long-term vision for investing in the community and making the lives of its residents better.

The city has designated more than US$85M to implement the plan over the next 10 years. It includes the elevation of homes, a raised shoreline, improvements to public housing and community centers, rededication of open land for use as public space, and improvements to Bayswater Park. Finally, to relieve some of Edgemere’s isolation, a function of its distance from the city’s economic centers, and years of disinvestment, the plan provides for improvements to streets and transportation and an increase in neighborhood amenities. At present, most residents must leave the neighborhood to shop for food or other basic items, while physical barriers like extensive highway guardrails and other structures prevent residents from even accessing the beaches and bay shores that surround them.

Acknowledging that Edgemere’s existing poverty and isolation exacerbated the impacts of Hurricane Sandy, New York is committed to tackling those underlying stresses as it also develops infrastructure designed to withstand future shocks, strengthening the community’s ability to thrive into the future.

**World Wildlife Fund:**
*Green Recovery & Reconstruction Training Toolkit for Humanitarian Aid*

The World Wildlife Fund, an international non-profit whose mission is to conserve nature and reduce threats to biodiversity, offers cities a Green Recovery and Reconstruction Training program. The training is meant to increase awareness of environmentally responsible disaster response approaches. It consists of 10 modules, each designed to be delivered in a one-day workshop. Topics include: environmental impact assessment, shelter and site selection, materials and supply chain, water and sanitation, livelihoods, construction and disaster risk reduction. The training can be combined with other resources offered by WWF, such as the Environment and Disaster Management Help desk, a team and resource facility that provides remote guidance and support for environmentally responsible disaster management.
ACROSS THE NETWORK: DISASTER RECOVERY

Other member cities are designing innovative models of resilient disaster recovery, including:

- **BOULDER** is planning to partner with local businesses and associations to develop its post-disaster impact assessment capacity. The efforts will better position the city to assess the impact of disasters on businesses, and administer recovery funds as soon as possible. Complementing this work for the private sector, the city has partnered with its surrounding county to develop a “Home Preparedness Assessment program” that will help homeowners “bounce back better” from natural disasters and other stresses. Overall, Boulder’s Resilience Strategy advocates for a deeper understanding of the interconnectivity between economic resilience, natural disasters, and community resilience.

- **SAN FRANCISCO**’s vulnerability to earthquakes poses challenges to planning for social equity and affordability. With preventing displacement as a central resilience priority, the city is supporting interconnected initiatives to meet its goal of safely keeping 95% of residents in San Francisco during times of disaster. For example, a new Citizens Advisory Recovery Committee (Recover-SF), will elevate local voices and improve connections between the city government and vulnerable residents. Additionally, a housing recovery plan will curb long-term displacement and expand shelter access.

- **SEMARANG**’s resilience is threatened by tidal flooding and dengue fever, and the potential for these to grow more severe in the future due to increased rainfall flooding and land subsidence. Urban development along the coast and rivers has compounded the city’s geographic vulnerability, resulting in a range of Strategy initiatives prioritizing disaster and disease management. For example, Semarang has recognized the interdependent relationship between disaster recovery and community mobilization, and so is focusing on creating community-led disaster preparedness groups. Public awareness campaigns will also support participatory disaster mapping for shocks including landslides, flooding, and dengue outbreak, and strengthen coordination during and after emergencies through digital communications systems.

- **WELLINGTON** is embracing a regional approach to disaster recovery, in recognition that working across jurisdictions strengthens a city’s resilience to shocks. To grow opportunities for better partnership and coordination across local governments and sectors, Wellington is developing a shared Pre-disaster Recovery Framework. On top of clarifying governance arrangements, the framework will enhance decision making and support linkages to resilience investments so that regional risks can be better identified and mitigated. Additionally, through a separate project, Wellington will launch a temporary housing study to better inform future recovery planning.
INNOVATING FINANCIAL SOLUTIONS
Mexico City’s Water Fund Will Meet Basic Needs and Finance Environmental Sustainability

Mexico City is deploying an innovative Water Fund which will offer an economically self-sustaining method for meeting the basic needs of its vulnerable citizens while also protecting its critical environmental resources.

100RC’s member cities are pledging their own resources for resilience building, with 75% of all Resilience Strategy initiatives relying at least partially on city funding, and nearly 50% of that funding already committed by the time the Strategies were published. But significant gaps still exist, as less than half of all initiatives thus far are fully funded. Funding is often a challenge for cities; recent research on 80 global cities found that only 25% of them are able to issue municipal bonds, and only 20% are able to borrow from the state.37 Taken together, Resilience Strategies therefore represent a clear opportunity for investors, philanthropists, or otherwise mission-driven capital to flow toward well-structured projects within an aggregated marketplace of global demand across a range of topics.

In particular, the multiple benefits inherent to urban resilience-building interventions are a natural fit for innovative social finance, a rapidly developing tranche of global markets in its own right. The term “innovative finance” includes a range of financial approaches to addressing development challenges, including social enterprise, impact investment, transaction taxes, and levies on goods and services. It may be provided by actors such as the private sector, development banks, foundations, national governments, or multilaterals. Since 2000, innovative financing mechanisms have experienced 11% annual growth, and in total have mobilized over US$73 billion to support investments in energy and environment (US$14 billion), access to finance (US$9 billion), and global health (US$7 billion), with an additional US$43 billion spread across multiple sectors.38

As a tool for development, innovative finance is an excellent option for cities looking to fill gaps in their ability to meet the basic needs of their citizens, and an initiative from Mexico City’s Resilience Strategy illustrates this potential. For decades ranked among the largest urban areas in the world, Mexico City (CDMX) is a vibrant metropolis and the oldest capital city in the Americas. Its land was originally settled by indigenous peoples over 700 years ago, who built their city of 300,000 on an island in the middle of a large series of lakes.39 As the city grew through the colonial era and into modern times to reach 21 million inhabitants, it developed and expanded directly atop those lakes. This geographic legacy has created unique and substantial challenges to the city’s massive infrastructure. The lake also became the subsurface aquifer to the city’s water supply. Overexploitation of this aquifer has not only caused the city to rapidly sink into the ground, when combined with a lack of adequate infrastructure to capture rainfall or distribute existing water supplies, it has meant today that nearly 20% of Mexico City’s residents lack reliable access to running water.
The city has a high level of inequality, and 28.5% of its population lives in poverty. The poorest residents currently must pay a high premium to meet their basic water needs through the unreliable delivery of water from privatized tanker trucks. Mexico City has sought innovative financing methods as a solution to this challenge, and is now partnering with The Nature Conservancy and the private sector to structure a Water Fund as one of its Resilience Strategy initiatives.

Water funds are conservation mechanisms that regulate the water cycle and protect ecosystem features in order to strengthen the water security of urban areas. They attract private, public, and philanthropic funding in an organized and transparent manner from large water users and other donors, such as drinking water and sanitation operators, irrigation districts, hydroelectric plants, and philanthropic foundations. Grounded in the fact that it is often much cheaper to prevent resource degradation in the first place than it is to remediate it after the fact, these funds enable downstream water users, such as cities, to jointly invest in upstream, nature-based efforts to secure their water supply, such as improved land management or reforestation. Water funds achieve economic sustainability by investing in financial markets, and leveraging returns to protect extensions and land easements for conservation, developing technical support for water management, and promoting sustainable paths for community development.

The Water Fund for CDMX aims to reduce imbalances in the use of the aquifer and promote a positive long-term water balance. Conservation of aquifer recharge areas will contribute to making the city’s water supply system more robust and redundant, lowering costs while improving and expanding access for those currently living in water poverty. At the same time, these actions will have a number of benefits, including reducing subsidence, assisting with mitigation of and adaptation to climate change (for example, in a scenario of regional drought), and protecting biologically significant sites. At the time of publication, Mexico City’s Water Fund had nearly US$400,000 already invested, and another US$1.7M in pledges from development banks, private sector foundations and CSR funds, and the environmental ministry of the national government.

The action contributes to the city’s capacity to adapt to climate change because it promotes the integrity of ecosystems to maximize their hydrological functions. In addition, it helps make the city’s drinking water supply system a more robust one that will buffer the city during droughts and other disruptions.
HOW THE 100RC NETWORK IS BUILDING URBAN RESILIENCE

TAKING ACTION: INNOVATIVE FINANCE

Mexico City, Mexico
ACROSS THE NETWORK: INNOVATIVE FINANCE

Many 100RC cities have designed resilience initiatives that will leverage innovative financing models to meet the needs of their residents, including:

- **BOULDER** is demonstrating the value of applying a resilience lens to city financial management. The city is leveraging its capital budgeting process to better understand how local expenditures interconnect and impact resilience priorities within climate change and energy policies. This process is allowing Boulder to identify opportunities for internalizing costs, and moreover to identify the risk and resilience tradeoffs of investments citywide.

- **NORFOLK** has been a leader in developing innovative financing methods to catalyze resilience. Through collaborative partnership with the private sector, the city has created the RE.bound Program, which is designing a catastrophe bond to reduce the city’s vulnerability to natural disasters and will support risk mitigation solutions for projects. For example, one approach integrates insurance coverage into cost-effective green infrastructure options. Additionally, Norfolk is exploring how social impact bonds can be employed to support social service programs. This financing method could potentially decrease costs for city services.

- **OAKLAND** is exploring how to finance adaptation to a rapidly changing and complex future, in order to build a more connected and economically secure city. The city’s EcoBlock project is exploring new financial models like financing districts, which could support the deployment of renewable technologies and seismic retrofits across the housing sector.

- **ROTTERDAM** understands the importance of lifecycle considerations in infrastructure development. Too often, these are not incorporated into traditional project design. To bridge this gap, the city is working to embed resilience thinking into the decision-making processes for critical underground infrastructure, by employing cost-benefit analysis which takes into account holistic concerns. These efforts will amplify resourceful and integrated approaches, building Rotterdam’s capacity to be infrastructure-ready for the twenty-first century.

- **THESSALONIKI** has high levels of air pollution, in part due to increased car use and limited public transit options. In response to this challenge, the city is creating a metropolitan Air Quality Fund that will act both as a financing tool and as an integrated governance structure. Through this aspirational initiative, Thessaloniki will leverage the innovative finance mechanism of an Air Quality Fund to implement best practices from around the globe, including developing bike lanes at the metropolitan scale and offering free transit days. By monitoring and assessing local air quality, the city aims to mitigate pollution and protect vulnerable populations and historical assets while unifying its wider metro region around a common vision.
Swiss Re together with Veolia:
New Models for Disaster Insurance

The world’s second-largest reinsurance company, Swiss Re, has joined forces with Veolia, a French transnational corporation specializing in public asset and utility management, to develop an innovative insurance model that improves and streamlines existing disaster recovery and response processes. Under their partnership agreement, Swiss Re and Veolia will work with cities around the world to help them understand the risk exposure of their critical assets under current and future climate scenarios. Together, the partners are providing an innovative risk and recovery transfer service with which cities can better budget for emergency management. By using resources more efficiently, and planning ahead for major shocks and stresses, cities not only strengthen their vital infrastructure, they also limit economic interruption and can quickly begin to repair damage after a disaster, without being forced to wait for insurance assessments, payouts, and solicitations for repair proposals. The result of this groundbreaking partnership will not only arm cities with new tools for the constantly evolving risks they face, but also ensures the vibrancy of cities by building their economic and physical resilience.
THE ROAD AHEAD
Cities are embracing a central role in addressing the challenges of the 21st century. With mass migration, extreme weather, social and economic inequity, and aging and inadequate infrastructure disproportionately affecting urban centers, cities are developing new strategies that tackle these challenges and help ensure they will survive and thrive in the face of a wide variety of shocks and stresses.

This report has looked at initiatives being planned and implemented across our Network of member cities. It profiled resilience actions from 33 different cities, on the topics of urban mobility, informal settlements, natural assets, water security, neighborhood regeneration, disaster recovery, and innovative finance, as well as highlighting examples of the services available from our Platform of Partners.

Over the last 4 years, the 100 Resilient Cities Network has catalyzed and shared transformative thinking and planning, helping to connect cities to the resources and expertise required for them to begin to take action. The next era of our partnership with these dynamic cities and global leaders will be focused on implementation. It’s one thing to talk about transformation, it’s another to design, resource, and implement actions and initiatives that actually deliver systemic change. That is the work our cities have begun—profiled throughout this report—and that is the work we are committed to continuing.

The metro areas of 100RC’s member cities are home to nearly 500M people. If we can collectively build solutions like the ones profiled in this report—initiatives that reduce flooding while increasing water security, that integrate and protect informal communities, that improve mobility while reducing racial inequity—we can have a significant impact on the well-being of millions of people, especially the poor and vulnerable.

It is often said that the 21st century will be the century of cities. As we witness many national governments falling victim to partisan politics, political intransigence, or populist appeals that prey on fear and xenophobia, it reinforces the need for cities to step in and lead, and it reinforces how important a strong network of cities taking action can be for our collective future. Whether forming a bulwark against nationalism or defending our global commons through innovative strategies for valuing and protecting natural assets, cities are having an international impact and setting a new trajectory for a vibrant global future.

Melbourne, Australia
Da Nang, Vietnam
OUR CITIES
Accra, Ghana
Addis Ababa, Ethiopia
Amman, Jordan
Athens, Greece
Atlanta, United States of America
Bangkok, Thailand
Barcelona, Spain
Belfast, United Kingdom
Belgrade, Serbia
Berkeley, United States of America
Boston, United States of America
Boulder, United States of America
Bristol, United Kingdom
Buenos Aires, Argentina
Byblos, Lebanon
Calgary, Canada
Cali, Colombia
Can Tho, Vietnam
Cape Town, South Africa
Chennai, India
Chicago, United States of America
Christchurch, New Zealand
Ciudad Juarez, Mexico
Colima, Mexico
Da Nang, Vietnam
Dakar, Senegal
Dallas, United States of America
Deyang, China
Durban, South Africa
El Paso, United States of America
Glasgow, United Kingdom
Greater Manchester, United Kingdom
Greater Miami and the Beaches, United States of America
Guadalajara, Metro Area, Mexico
Hai Yan, China
Honolulu, United States of America
Huangshi, China
Jaipur, India
Jakarta, Indonesia
Kigali, Rwanda
Kyoto, Japan
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Louisville, United States of America
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Mandalay, Myanmar
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Minneapolis, United States of America
Montevideo, Uruguay
Montreal, Canada
Nairobi, Kenya
Nashville, United States of America
New Orleans, United States of America
New York, United States of America
Norfolk, United States of America
Oakland, United States of America
Panama City, Panama
Paris, France
Paynesville, Liberia
Pittsburgh, United States of America
Porto Alegre, Brazil
Pune, India
Quito, Ecuador
Ramallah, Palestine
Rio de Janeiro, Brazil
Rome, Italy
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Salvador, Brazil
San Francisco, United States of America
San Juan, Puerto Rico
Santa Fe, Argentina
Santiago (Region), Chile
Santiago de los Caballeros, Dominican Republic
Seattle, United States of America
Semarang, Indonesia
Seoul, Korea
Singapore, Singapore
St. Louis, United States of America
Surat, India
Sydney, Australia
Tbilisi, Georgia
Tel Aviv, Israel
The Hague, The Netherlands
Thessaloniki, Greece
Toronto, Canada
Toyama, Japan
Tulsa, United States of America
Vancouver, Canada
Vejle, Denmark
Washington D.C., United States of America
Wellington, New Zealand
Yiwu, China
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