

PIONEERED BY THE
ROCKEFELLER FOUNDATION

100 RESILIENT CITIES



JANUARY 2017

100RC: CATALYZING THE URBAN RESILIENCE MARKET



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Cities stand at the forefront of the challenges and opportunities of the 21st century. Today, just over 50% of the world's population lives in cities, and yet those areas are already responsible for 80% of global GDP – our economy is undoubtedly an urban one. Aging infrastructure, extreme weather, and mass migration will all disproportionately affect urban centers. By 2050, over 70% of the world's population will live in cities, deepening and widening the impact of these patterns.

As today's cities adapt to these challenges, it is estimated that more than 60% of metropolitan regions that will exist in 2050 have yet to even form. As they do, over 3 billion more people will be added to urban centers, and massive investments will be made to construct the infrastructure necessary to support them.

These global pressures affect individuals and systems on the local level, in the cities where they live. While presidents and prime ministers must slowly navigate national and international politics to reach a consensus on solutions, mayors and city leaders are already innovating and deploying new ideas, and making the investments that will provide tangible benefits for their citizens.

Urban resilience is the ability of a city to survive, adapt, and grow no matter what kinds of chronic stresses and acute shocks they experience. Resilience requires cities to take transformative actions that make cities better, in both the short- and long-term, and allow cities to not only endure, but thrive, in both good times and bad.

100 Resilient Cities (100RC) possesses a unique vantage point for understanding this changing landscape. Though the concept of urban resilience is relatively new, the holistic lens it offers to decision makers is uniquely suited to meet the needs of the modern city. Several common challenges have emerged from our work over the past three years with member cities seeking to build urban resilience, and we are beginning to see the market respond with innovative solutions.

Cities committed to resilience are already actively collaborating with resilience experts and with one another, but service providers and investors from the private sector will be required to bridge the gap between cities' current capacities and what they need to thrive in the 21st century.

100RC is working in response to two current truths: (1) cities are complex, siloed ecosystems and (2) existing market solutions that could be applied to urban challenges do not scale or otherwise reach cities efficiently. One of our goals in launching 100RC was to aggregate information on the evolving demands of resilient cities, and signal to the private sector what tools and services cities need.

Four Major Areas of Opportunity:

1) Water Management

Water management issues, including flooding, water pollution, and water shortages, are priority risks for nearly all of our cities globally. The twin effects of climate change and population growth will continue to generate significant demand for integrated water management solutions in the years to come.

2) Big Data Management

“Smart City” technologies have captured the imagination, offering city leaders the ability to make data-driven decisions that optimize increasingly scarce resources. The private sector is rapidly developing new ways to manage a growing wealth of data, but there is still room to innovate in how those technologies are tailored to the disparate global needs of cities seeking to build resilience.

3) Innovative Financing

Many of our cities contend with inadequate access to capital and financing for their identified resilience projects; innovative approaches to financing such projects are in greater demand than ever. In addition, resilient cities have resoundingly expressed their need for more creative and forward-looking risk management and insurance options.

4) Technologies for Community Engagement

Plans and projects fail without proper support from local communities. New technologies have the capacity to revolutionize the ways in which city governments can garner input and support from local communities, and therefore such tools are in high demand across the 100RC network.

¹ “Removing the Bottleneck for Infrastructure Investments,” Global Infrastructure Basel, May 2014, http://resilient-cities.iclei.org/fileadmin/sites/resilient-cities/files/Resilient_Cities_2014/PPTs/A/A1_Tafur.pdf

100RC creates a unique space in which forward-thinking cities are working together to strengthen the entire urban ecosystem and ensure their vibrancy in the face of an uncertain future. Through our work we have gained a deeper understanding of cities' resilience priorities and the kinds of tools and services they need to fulfill them.

Resilient cities can only be built with collaboration from the private sector. We have already witnessed rapid uptake of the initial resilience products that companies have brought to market in response to the demands of global cities.

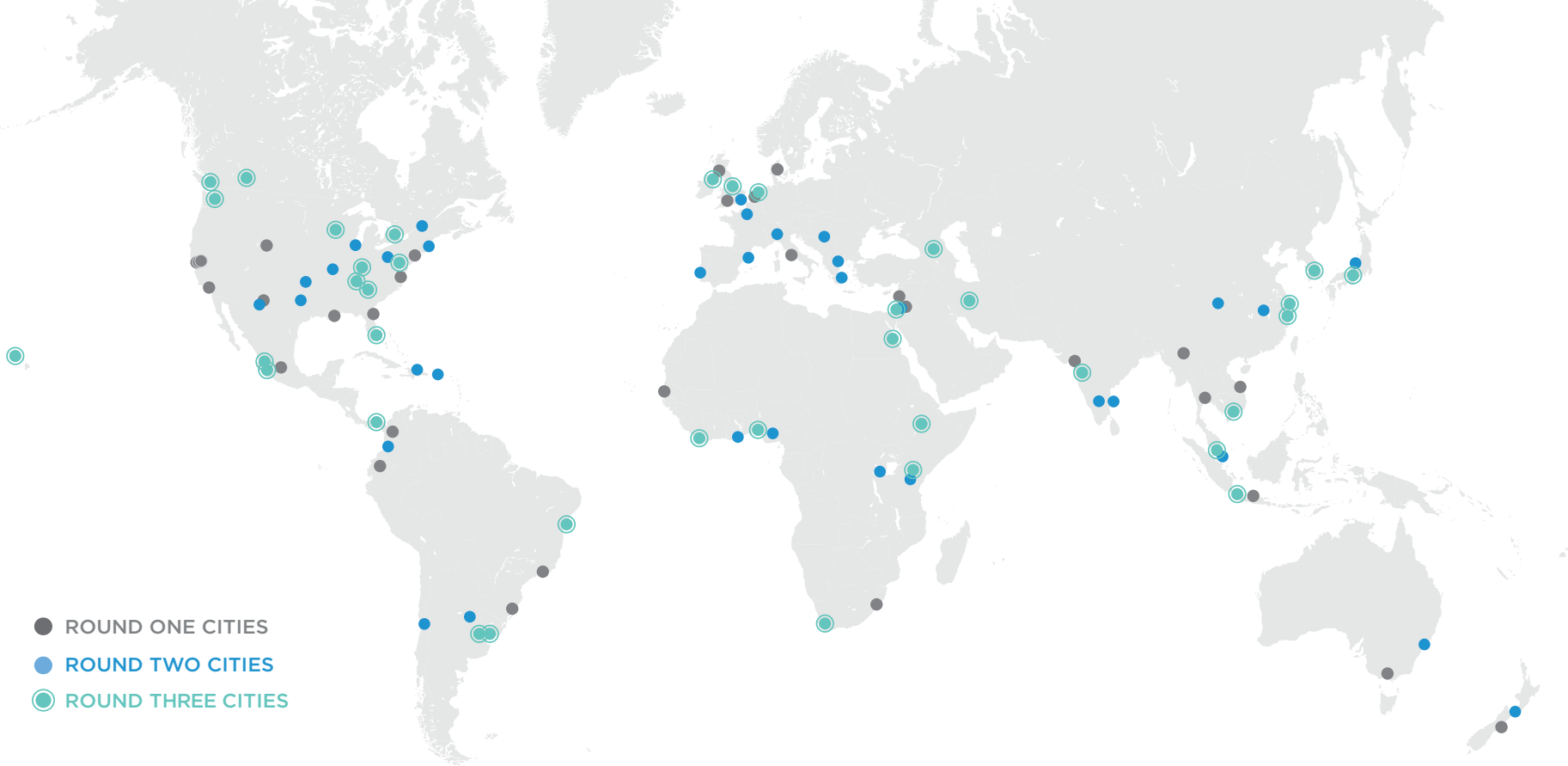
As you invest in the communities and economies of the 21st century, thinking and planning “at city-scale” will become ever-more important, with an ever-growing market for the most optimal and scalable solutions to pressing urban challenges. 100RC's vanguard network of resilient cities is leading the charge.

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100 RESILIENT CITIES

WHAT IS URBAN RESILIENCE?

Urban Resilience is 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.



- ROUND ONE CITIES
- ROUND TWO CITIES
- ROUND THREE CITIES

OUR MEMBER CITIES

ROUND ONE CITIES

- Bangkok
- Berkeley
- Boulder
- Bristol
- Byblos
- Christchurch
- Da Nang
- Dakar
- Durban
- El Paso
- Glasgow
- Los Angeles
- Mandalay
- Medellin
- Melbourne
- Mexico City
- New Orleans
- New York
- Norfolk
- Oakland
- Porto Alegre
- Quito
- Ramallah
- Rio de Janeiro
- Rotterdam
- San Francisco
- Semarang
- Surat
- Vejle

ROUND TWO CITIES

- Accra
- Amman
- Athens
- Bangalore
- Barcelona
- Belgrade
- Boston
- Cali
- Chennai
- Chicago
- Dallas
- Deyang
- Enugu
- Huangshi
- Juarez
- Kigali
- Lisbon
- London
- Milan
- Montreal
- Paris
- Pittsburgh
- Rome
- San Juan
- Santa Fe
- Santiago de los Caballeros
- Santiago, Metro
- Singapore
- St. Louis
- Sydney
- Thessaloniki
- Toyama
- Tulsa
- Wellington

ROUND THREE CITIES

- Addis Ababa
- Atlanta
- Belfast
- Buenos Aires
- Calgary
- Can Tho
- Cape Town
- Colima
- Greater Manchester
- Greater Miami and the Beaches
- Guadalajara
- Haiyan
- Honolulu
- Jaipur
- Jakarta
- Kyoto
- Lagos
- Louisville
- Luxor
- Melaka
- Minneapolis
- Montevideo
- Nairobi
- Nashville
- Panama City
- Paynesville
- Pune
- Salvador
- Seattle
- Seoul
- Tbilisi
- Tel Aviv
- The Hague
- Toronto
- Vancouver
- Washington, D.C.
- Yiwu



THE ROLE OF 100RC

As a global non-profit, 100RC provides 4 core offerings to our member cities:

1) We provide the funding for the city to hire a **Chief Resilience Officer (CRO)**. The CRO works across city government silos to create and implement a resilience strategy, serving as a senior advisor to the Mayor, promoting resilience thinking, coordinating resilience efforts across government and multi-sector stakeholders, and liaising with other CROs, 100RC staff, and resilience service providers.

2) We pair each city with a consulting Strategy Partner to develop and deliver a **Resilience Strategy**, which is a tactical roadmap that articulates the city's resilience priorities and specific initiatives for short-, medium- and long-term implementation.

3) We grant our network cities access to a **Platform of Services** to support strategy implementation. The **Platform Partner** network consists of a carefully selected group of private sector companies, universities, NGOs, and publicly funded labs that provide resilience-building tools, products, and services to our cities to help them design and execute the initiatives within their resilience strategies.

4) We provide our cities with membership to the **CRO Resilience Practitioner Network**, through which CROs can celebrate successes, discuss challenges they face in their cities, share insights on their work, and provide support for one another.

SEMARANG,
INDONESIA

WATER MANAGEMENT

WHAT HAVE WE SEEN SO FAR?



WATER MANAGEMENT

Major storms and aging infrastructure regularly reveal the extent of work cities need to do on water management, and the new lens of resilience they must use for it. The World Resources Institute predicts that by 2030, the number of people affected by flooding could triple to 54 million, with an attendant fivefold economic cost, amounting to \$521 billion in annual GDP financial disruptions.

The social, economic, and public health implications of water management extend far beyond flooding – according to the World Health Organization, at least 1.8 billion people currently use contaminated drinking water, which can transmit cholera, dysentery, typhoid, polio, and diarrhea. Furthermore, by 2025, half of the world’s population will be living in water-stressed areas, and they will increasingly be concentrated in cities.

Resilient cities are looking to collaborate with companies that understand this and can offer dynamic water management solutions that will enable a city to thrive in the face of these multi-faceted water challenges.

²World Resources Institute, <http://floods.wri.org/>

³“Drinking Water, Fact Sheet,” World Health Organization, last modified November, 2016, <http://www.who.int/mediacentre/factsheets/fs391/en/>

The twenty resilience strategies published to date indicate a wide-reaching demand for water management tools and services:

- Flooding Solutions: 17 cities, 35 total initiatives (these include coastal and river flooding, with many demands for innovative stormwater infrastructure).
- Multifunctional Green Infrastructure: 10 cities, 10 total initiatives.
- Secure Access to Potable Water: 6 cities, total 11 Initiatives.

Demands for resilient water management options from our cities include:

- Multi-purpose green infrastructure (GI) that controls flooding, repurposes rain-water and beautifies the city.
Berkeley; Bristol; Glasgow; Medellin; Mexico City; New York; Oakland; Semarang
- Innovative infrastructure for wastewater treatment plants.
Byblos; Da Nang
- Adaptive waterfront development and climate resilient critical infrastructure.
Norfolk; Rotterdam
- Floating structures that help combat severe flooding.
Mexico City; Norfolk; Rotterdam

RESILIENCE R&D: INNOVATIVE PLANS & SOLUTIONS FOR WATER MANAGEMENT

Cleaner Water Tool | 100RC & Veolia

100RC is currently collaborating with our Platform Partner, Veolia, to develop a tool for addressing one of the world's most fundamental public health concerns: access to clean water. Many cities recognize the social and economic value of potable water, but are unable to secure the capital required to provide it to all of their citizens. In response to this urban challenge, 100RC is partnering with Veolia to develop the Cleaner Water Tool, which aims to first measure the co-benefits of projects that improve drinking water quality and then to identify financing structures that leverage the monetary value of those co-benefits to encourage investment.

Public Water Plazas to Prevent Flooding & Foster Social Cohesion | Mexico City & Deltares

In 2015, Mexico City and 100RC Platform Partner Deltares began a collaboration on water plazas that has since led to a much larger scope of work in the city's unique zone of Xochimilco, a residential and agricultural area threaded with islands and canals. Under normal weather conditions, the planned water plazas will operate like any other public square, where people meet, spend time, and attend special events. During rainstorms, water from surrounding streets will be directed into the squares, which have

been specially engineered for pooling and draining. The French Development Bank is already funding Phase I of Deltares' plan for Xochimilco, while 100RC's partner Rebuild by Design (RBD) is leading a community engagement process to ensure that the water plazas not only provide catchment areas to control flooding, but also promote social cohesion and appealing public spaces.

Watershed Work & Flood Prevention | Paris & Amec Foster Wheeler

After the destructive floods of 2016, Paris began to rethink its relationship to the Seine. With 100RC Platform Partner Amec Foster Wheeler, the city has launched a comprehensive study of its natural watershed, which is situated well outside the city's boundaries. Through satellite mapping and analysis of land use and topography, the project will identify key zones upstream of Paris where land restoration would improve water retention and reduce the flow of water into the city, thereby mitigating the severity of floods.

Green Infrastructure & Street Improvement Projects | Berkeley

To control flooding and make its stormwater infrastructure more resilient, the city of Berkeley in California, USA has begun to install numerous Green Infrastructure (GI) projects. Unlike conventional stormwater infrastructure, GI can create multiple benefits beyond flood mitigation, including protecting ecosystems by removing pollutants, beautifying a neighborhood, and, potentially, enabling the capture and use of stormwater for other purposes.

ROTTERDAM,
THE NETHERLANDS



DATA MANAGEMENT

WHAT HAVE WE SEEN SO FAR?

DATA MANAGEMENT

“Smart City” technologies have captured the global imagination, promising the ability to make data-driven decisions that optimize increasingly scarce resources. They allow city leaders to operate on the core principles of resilience, and to share, integrate, and visualize data in a way that leads to better governance and provides multiple benefits to multiple communities.

The private sector is rapidly developing new ways to capture, analyze, and apply a growing wealth of data, but there is still room to innovate in how those technologies are tailored to the disparate needs of global cities seeking to build resilience, who encompass the full spectrum of digital capacity.

Almost all of our cities see becoming “Smart” as a key part of their path toward resilience, and therefore are seeking to better harness the potential offered by big data management. Cities with extensive digital capacity, such as Rotterdam, are looking for even more advanced and creative solutions that further build resilience and allow them to transform into a truly smart city. Other cities in our network are still working to build a digital infrastructure foundation in order help guide public and private sector activity. Understanding a city’s place on this spectrum is key to creating effective interventions that can support integrated data-driven decision-making.

The twenty city strategies published to date reflect global demand for big data management:

- Digital Infrastructure: 13 cities, 25 initiatives.
- Data Improvement and Standardization: 11 cities, 27 initiatives.
- Open Data Sourcing: 11 cities, 18 initiatives.

Demands for big data management options from our cities include:

- Digital community communication platforms.

Byblos; Da Nang; Glasgow; Medellin; Mexico City; Semarang; Greater Christchurch, New Zealand; San Francisco; Vejle

- Increased quality and capacity of city information systems.

Berkeley; Byblos; Medellin; New York; Semarang

- Improved public information on city permitting processes.

San Francisco; Semarang; New Orleans

- Improved use of quantitative and qualitative metrics to promote transparent and equitable outcomes.

New York; Oakland

RESILIENCE R&D: INNOVATIVE SOLUTIONS FOR BIG DATA MANAGEMENT

BYBLOS,
LEBANON

Digital Infrastructure Fundamentals | Byblos & ESRI

The city of Byblos, Lebanon is working with Platform Partner ESRI to build out its digital infrastructure. This is a crucial moment in Byblos' evolution – the city's numerous natural, cultural, and economic assets are under significant strain from congestion, severe weather, haphazard development, and regional instability. Byblos hopes that improving its data collection and mapping capabilities will allow it to address these issues holistically and avoid the type of siloed efforts that have hindered development in the past.

Cyber Resilience | Rotterdam & Microsoft

The city of Rotterdam is working with 100RC partner Microsoft to transform its cyber-security efforts into true cyber-resilience. Rotterdam, along with many 100RC cities are looking beyond common cyber security efforts that reduce the risk of cyber-attacks, to ones that enable a more seamless recovery of data networks and continuation of city operations after an attack occurs.



NEW ORLEANS,
U.S.A.



INNOVATIVE FINANCING

WHAT HAVE WE SEEN SO FAR?

INNOVATIVE FINANCING

Many of our cities grapple with inadequate access to capital and financing for projects. As regional and national budgets are increasingly constrained, cities find themselves responsible for securing the financial resources needed to provide services to citizens, and all-too-often have insufficient resources to fund the full range of their priority projects. Innovative approaches for financing resilience are therefore in greater demand than ever.

Cities are also searching for more creative and forward-looking insurance and risk-management models. For example, many have shown interest in mechanisms that incentivize infrastructure maintenance to mitigate major shocks, and streamline the payout process after major shocks do occur.

The twenty resilience strategies published to date include substantial demand for the development of innovative financing mechanisms tailored to city governments:

- Funding for Resilient Infrastructure: 13 cities, 26 total initiatives.
- Innovative Insurance Models: 7 cities, 8 total initiatives.

Demands for innovative financing services from our cities include:

- Alternative risk transfer arrangements.
Da Nang; Greater Christchurch; Mexico City; Medellin; New Orleans; Melbourne
- Increased private-sector participation in building urban resilience.
Greater Christchurch; Mexico City; Norfolk
- Innovative financial and regulatory instruments for public space management.
Mexico City
- Mechanisms for investment in climate-smart mobility projects.
Rio de Janeiro

RESILIENCE R&D: EARLY INNOVATIVE FINANCING SOLUTIONS

Stormwater Financing | Berkley, Oakland, & Stantec/ MWH Global

Two 100RC cities in California, U.S.A. – Berkeley and Oakland – are collaborating to meet their shared demand for stormwater financing. 100RC Platform Partner Stantec/MWH Global responded to their need by providing a technical advisory service for water & waste water that reviews the financial state of the cities' current stormwater program and recommends a long-term funding strategy to support future stormwater capital investments and O&M costs. This experience offers strong best practices and lessons learned for many other cities and potential partners.

Innovative Insurance Models | New Orleans & Swiss Re-Veolia

100RC Platform Partners Swiss Re and Veolia have joined forces in New Orleans 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 additional 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.

MELBOURNE,
AUSTRALIA



INNOVATIVE TECHNOLOGY FOR COMMUNITY ENGAGEMENT

WHAT HAVE WE SEEN SO FAR?

INNOVATIVE TECHNOLOGY FOR COMMUNITY ENGAGEMENT

Community engagement is fundamental to building urban resilience. New technologies have the capacity to revolutionize the ways in which city governments can garner input and support from local communities, particularly those sectors of society historically left out of such dialogues. These technologies allow cities to build social cohesion and a strong sense of community in the face of an uncertain future. In many cities the demand for these engagement tools is surging: when many of our European cities, for example, applied to the 100RC challenge in 2013 and 2014, migration was not on their list of priority shocks and stresses. In the last two years the issue has moved to the forefront, driving considerable interest in the development of innovative engagement tools. These tools are being designed to reach vulnerable communities (both migrant and local) and are crucial for cities to mitigate the risks and harness the great potential of these populations.

The recent waves of global migration – the largest since WWII – make this demand even more urgent. For example, when many of our European cities applied to the 100RC challenge in 2013 and 2014, migration was not on their list of priority shocks and stresses; in the last two years the issue has moved to the forefront of their concerns.

All of our cities around the world are exploring ways to integrate their various communities into the planning process, including the newly arrived, whether or not they remain permanently.

The twenty resilience strategies published to date demonstrate growing demand for new technologies for community engagement in the urban setting:

- Digital Infrastructure for Community Engagement: 14 cities, 30 initiatives.

We have seen a variety of demands and initiatives from our cities:

- Communication platforms on risk and resilience for citizens.
Glasgow; Mexico City; New Orleans; Rotterdam; Vejle; Boulder
- Technologies with which to collaborate with resident on social issues, including crime and mental health.
Byblos; Greater Christchurch; New York; Rotterdam; Vejle
- High-speed internet service for low income communities.
New Orleans; New York
- Enhanced performance and utilization of internet-based participatory reporting.
Norfolk; Semarang

RESILIENCE R&D: EARLY INNOVATIVE COMMUNITY ENGAGEMENT TECHNOLOGY

Enfranchisement for New Residents | MasterCard

Simplifying a city's ability to administer its social programs and making it easier for recipients to access benefits is key to allowing those segments of the population to be fully engaged participants in their communities. Partnerships with financial institutions such as MasterCard on digital payments programs for migrants have been critical to achieving the flexibility needed to respond to the refugee crises arising in several of our cities, including Athens and Amman. Recipients of funds have the autonomy to prioritize spending to meet their needs, while local businesses benefit from the expansion of their client base. Despite being referred to as cash-transfer programming, this kind of assistance increasingly works via electronic fund transfers rather than cash.

Global Addressing Systems | What3Words

What3Words translates geographic coordinates into three dictionary words, providing addresses and grids for many places that need them, especially in the developing world. Filling the gap that some nations' postal systems cannot, What3Words can provide a city or region (or nation) with an important infrastructural need it cannot develop on its own.

⁴ Marisa Grimes, "MasterCard Prepaid Debit Cards Provide Refugees with Mobility, Flexibility and Dignity", 20 June 2016, <http://newsroom.mastercard.com/2016/06/20/mastercard-prepaid-debit-cards-provide-refugees-with-mobility-flexibility-and-dignity/>

Participatory Planning Platforms

Several new apps and online platforms are opening new avenues for communication and enabling cities to engage residents for their input on discrete issues, or for resident-dependent information gathering.

- **Neighborland:** a communications software that enables civic organizations, including city agencies, universities, and non-profits, to collaborate with constituents and stakeholders. This dialogue allows for communities to have significant input on the development of their own neighborhoods. Through its use, city governments have seen between a ten- and hundred-fold increase in engagement on their projects compared with traditional outreach models such as surveys and community meetings.
- **Streetwyze:** a mobile mapping and SMS app that integrates official data and local knowledge that can be crowdsourced and shared in real time. Streetwyze provides a valuable bridge between "top down" information and "bottom up" data that can more aptly track events as they unfold. Overcoming the common disconnect between these two types of information is essential for a city to be able to create resilient solutions that address the full context of a community and its needs.

Visualization of the City through Social Media | Melbourne & Twitter

A grant from Twitter is allowing the city of Melbourne, Australia access to both current and historic data, thereby enabling unprecedented insights into the city, including time-lapsed geographic mapping of the movement patterns of city residents; analyses of citizens' sentiments towards existing or proposed policies and programs; and heat-mapping of food-borne illnesses and other infectious diseases.



OPPORTUNITIES ABOUND FOR INNOVATION AND INVESTMENT IN THE GLOBAL URBAN RESILIENCE MOVEMENT...

Now more than ever, cities are looking to address their challenges in ways that strengthen the entire urban ecosystem and ensure their vibrancy in the face of an uncertain future.

To build resilience that will enable them to grow and thrive in the 21st century, cities around the world need innovative tools, services, and solutions.

WORK WITH 100RC TO ADDRESS THESE NEW MARKET DEMANDS

100RC creates a unique space in which forward-thinking cities are working together to strengthen the entire urban ecosystem and ensure their vibrancy in the face of an uncertain future. Through our work we have gained a deeper understanding of cities' resilience priorities and the kinds of tools and services they need to fulfill them.

With 80 strategies still to be published, and all 100 of them to be implemented, 100RC will continue to uncover new insights into what the world's cities will need as they build their resilience. Moreover, we are already seeing examples of the resilience movement spreading beyond our 100-city network, with non-member cities exploring the possibility of hiring a Chief Resilience Officer or otherwise applying a resilience lens to their planning.

One thing is clear - cities can formulate policies and learn from one another, but resilient cities can only be built with collaboration from the private sector. We have already witnessed rapid uptake of the initial resilience products that companies have brought to market in response to the demands of our cities.

As you and your company invest in the communities and economies of the 21st century, thinking and planning "at city-scale" will become ever-more important, with an ever-growing market for the most optimal and scalable solutions to pressing urban challenges. 100RC's vanguard network of cities is leading the charge.

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**FOR MORE INFORMATION
ABOUT BUILDING RESILIENCE IN
YOUR CITY, PLEASE VISIT US AT
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