INFORMATION ECOSYSTEMS IN ACTION: NEW YORK

A companion to

Mapping Information Ecosystems to Support Resilience: A Decision Support Framework

November 2014
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INTRODUCTION: EMBRACING CHANGE
THE CRITICAL ROLE OF INFORMATION

Embracing Change: The Critical Role of Information, a research collaboration between the Rockefeller Foundation and Internews’ Center for Innovation & Learning, combines Internews’ longstanding effort to highlight the important role of information with Rockefeller’s groundbreaking work on resilience. The project focuses on:

- Building knowledge around the role of information in empowering communities to understand and adapt to different types of change: slow onset, long-term, and rapid onset / disruptive
- Identifying strategies and techniques for strengthening information ecosystems to support behavioral adaptation to disruptive change; and
- Disseminating knowledge and principles to individuals, communities, the private sector, policymakers, and other partners so that they can incorporate healthy information ecosystems as a core element of their social resilience strategies.

The first step in the Embracing Change project was a report, “Why Information Matters: A Foundation for Resilience.” 1 “Why Information Matters” lays out a framework for analysis from an Information Ecosystems perspective, building on theoretical literature; policy literature; four case studies from previous Internews research; fieldwork in Jakarta, Indonesia; and observations from Internews’ 30+ years of experience in implementation across the globe. It identified Eight Critical Dimensions of information ecosystems to be used as a lens for assessment, analysis, and action.

“Why Information Matters” identifies critical principles defining the role of information:
- Information is as critical as the air we breathe;
- It supports the well-being and development of people around the world; and
- Without the ability to access, create, disseminate, and share critical information about the world around them, individuals are incapable of understanding the challenges they confront, adapting to an evolving environment, and ultimately, improving their lives.

The world is increasingly focused on building resilience, the capacity of individuals, communities, and systems to survive, adapt, grow, and even transform in the face of change, stress, shocks, and disruption, so that communities can better address their own challenges in the long term. “Why Information Matters” was a first step toward

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1 Published by Internews, November 2014. See innovation.internews.org
building a body of evidence and exploring the importance of healthy information ecosystems in understanding, building, and reinforcing resilience. Based on the Embracing Change research, it is our contention that information is the lifeblood of resilience – it is the foundation for human behavior and evolution.

The second report, “Information Ecosystems in Action: New York” builds upon the work in “Why Information Matters.” Drawing on theoretical literature, case studies, and primary field research, this report:

1. Briefly reviews the information ecosystems analytical framework;
2. Shares insights from field research in New York City, investigating the information ecosystems of communities affected by Hurricane Sandy;
3. Draws parallels between the information ecosystems of New York and Jakarta and reflects on the impact of these features on resilience; and
4. Lays the groundwork for the companion piece, Mapping Information Ecosystems to Support Resilience: A Decision Support Framework, and suggests future research and implementation.

The graphic on the following page outlines the major activities and products of Embracing Change: The Role of Information.
Why Information Matters: A Foundation for Resilience

1. INFORMATION ECOSYSTEMS IN ACTION: NEW YORK
2. MAPPING INFORMATION ECOSYSTEMS TO SUPPORT RESILIENCE
SUMMARY OF FINDINGS

This report shares key findings from a Pilot Study in New York City that explored how information ecosystems changed during the disruption of Hurricane Sandy and the recovery afterward. We developed a lens, the Eight Critical Dimensions of Information Ecosystems, which helps reveal multiple factors that impact resilience.

Through Embracing Change: The Critical Role of Information, Internews spent 2014 researching and defining the term Information Ecosystem, developing a framework through which it can be applied to better understand how communities use information to adapt to change, and testing the framework through further research. “Information ecosystems” broadly refers to a loose, dynamic configuration of different sources, flows, producers, consumers, and sharers of information interacting within a defined community or space. Information Ecosystems in Action: New York builds on the first report from Embracing Change, Why Information Matters, to further test out the framework.

Mapping Information Systems to Support Resilience: A Decision Support Tool (the companion to this report) offers a methodology of assess, analyze, act, and iterate in order to help those who use it to understand a community’s unique information obstacles, challenges, and needs. Part II of this report follows this methodology and includes a summary of ways to assess each dimension based on the findings from the New York Pilot study, and suggestions for how to analyze and act on that assessment. Once actions are tested, it is recommended that decision-makers iterate, based on the initial impact of their actions. Following is a summary of key suggestions from the New York research on possible ways to analyze and act, organized according to the Eight Critical Dimensions.

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<tr>
<th>1. Information Needs</th>
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<tr>
<td><strong>The right information was not available.</strong> There was a disconnect between information people needed (e.g. how to prevent damage to their home or property; where to go for information on obtaining assistance) and what was available to them. Official sources such as media and</td>
<td><strong>Investigate information needs using a broader range of approaches.</strong> Use a human centered approach; this means moving beyond assumptions and uncovering people’s actual needs.</td>
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<td><strong>Include different groups and communities’ voices as a priority</strong> at the planning stages. An understanding of</td>
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government did not provide communities with sufficient actionable, useable information. For example, people felt that repeated warnings to stay indoors were too broad to be really useful.

- **Lack of representation in the media.** Mainstream media failed to provide a hyper-local, inclusive perspective, leaving big gaps in the public narrative of how the storm impacted individuals and communities. Some people reported that their co-workers did not believe the extent of the devastation in their neighborhoods because it was not reported in the mainstream news.

- **Empower through visibility.** People needed their experiences to be seen and heard through media. This would be a meaningful and powerful validation of their own difficult experiences.

## 2. Information Landscape

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<tr>
<td>• During Sandy, primary information delivery infrastructure broke down. Pervasive power outages and downed cell phone towers transformed the information landscape.</td>
<td>• Conduct a thorough, periodic assessment of all communication systems used by populations – not just main information sources. The secondary and other sources provide the basis to design robust, redundant systems and create multiple alternate strategies to reach local populations.</td>
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<td>• Older technologies (such as HAM radio; corded landlines) may be more robust. Community members and neighbors at the most hyper-local level re-appropriated outmoded technology as they assisted one another.</td>
<td>• Assess the relative sensitivities of different information delivery systems to different disruptions. What are the most resilient systems? Include these as a key element of the information communications planning.</td>
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<td>• Local organizations may be critical partners in effective communications. Overall, well-resourced national organizations failed to leverage the advantages of local, innovative organizations.</td>
<td>• Increase understanding of how extemporaneous, non-hierarchical organizations intersect with traditional organizations, and incorporate these elements in communications strategies.</td>
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<td>• Information flows between local and regional levels are often ineffective. Information delivery systems focused primarily on information needs that were determined without community input.</td>
<td>• Improve information flows and communications. Challenges in information flows across national and local organizations and communities should be diagnosed and addressed.</td>
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### 3. Production & Movement

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<td><strong>Information for communities did flow but with varying levels of effectiveness.</strong> There were both successes and failures in responders’ ability to produce and disseminate needed information to affected communities; likewise in their ability to process information from communities.</td>
<td><strong>Using multiple methods to create and disseminate information improves flow and impact.</strong> Processes of production and movement are dependent not only on new tools for information sharing, but also on leveraging and integrating existing information dissemination practices.</td>
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<td><strong>Social media was an effective tool as both information delivery support and in connecting individuals and groups.</strong> For example, Guyon Rescue in Staten Island relied on affected people’s dissemination of their needs via social media. Beyond information creation and dissemination, social media was repurposed to coordinate relief and in the process also strengthened social ties.</td>
<td><strong>Coordinate information content and dissemination strategies.</strong></td>
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<td><strong>Electronic social media were technically vulnerable to disruption (since it relies on towers and electricity) and did not reach all groups within affected communities, like the elderly.</strong></td>
<td><strong>Identifying what types of information need to be produced and multiple ways to share and receive information as a periodic practice will not only help prepare for a crisis, it can create new and more robust information flows across organizations and communities.</strong></td>
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<td><strong>Information systems were not coordinated or centralized;</strong> for example, NYC Service had to consolidate four different assessment/damage maps that were being independently compiled.</td>
<td><strong>Effective information gathering and dissemination amongst recovery organizations should be coordinated where possible.</strong> Not only will this avoid duplication of efforts, it will assist in prioritization and identification of unmet needs and strategies to meet these.</td>
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<td><strong>Affected populations were not adequately informed of how /who to communicate with and what information was needed from them.</strong> For example, some people called the city’s 311 number; others updated their status on social media; others called neighbors. The approach people took was highly individual.</td>
<td><strong>Create robust open channels of communications to and from affected communities –</strong> constant dialogue is essential. This is not a one-way process.</td>
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### 4. Dynamics of access

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<td>• Severe environmental events had unanticipated effects on communities’ accustomed access points for information. Newer media requiring electricity was not functioning while some lesser-used, older forms of communication (such as corded landlines) became highly relevant. Face-to-face communication grew in relevance, with relief centers and community charging stations serving as important information hubs.</td>
<td>• Design communications and information management systems that include a range of alternate and linked delivery systems – pay attention to “older” technologies that may be less susceptible to disruption. Lower tech systems are always needed to provide a deep bench. • Conduct proactive ongoing assessments of how communities access information, and what the relative strengths and weaknesses of different platforms are during crisis. This can lead to more robust design for some platforms and the creation of more effective redundancies.</td>
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### 5. Use

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<td>• Television and radio are still the most accessed information sources. Traditional media such as television and radio have yet to be displaced in a dramatic way, and appear to continue to serve as the most important information sources for many New Yorkers, both older and younger. • Television access broke down under extreme conditions. • Despite frequent mention of social media in the mainstream press, less than ten per cent of survey respondents relied on social media for key information either during or after Sandy.</td>
<td>• Reality check - it is important not to embrace exaggerated notions of the usage or significance of newer communications platforms. • Mass media such as television broadcast should be included as a prime information management tool. Programming should be responsive to community needs, and incorporate a range of aspects beyond more conventional news, weather, etc. A more sophisticated conception, construction, and management of television broadcast is needed to withstand future stresses and shocks.</td>
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### 6. Impact of Information

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<td>• Delivery and engagement with information does not necessarily mean impact and response. Affected populations digested information about preparing for emergencies – but did not</td>
<td>• Provide information in the right form, via the right channels and at the right time. Research and understand what constitutes impact for different communities using more</td>
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necessarily take appropriate action. Sixty five percent of survey respondents indicated that they personally are as prepared for the next weather-related emergency as they should be; however, fifty one percent reported that they had taken no action to prepare.

- **Unstructured organizations can re-appropriate social media and have positive impact.** When social media is effectively used to coordinate a flat, decentralized organization, response to those in need can be observably increased. Centralized information and creative, flexible use of multiple information platforms by a widely dispersed / networked group of people, with lots of information touch points, worked well for Occupy Sandy.

human centered approaches. Devise appropriate communication and information creation strategies that address elements such as trust and influence to increase potential for response and action.

- Investigate how to improve and evolve. **Support emergent innovation (such as that of Occupy Sandy) – without imposing or taking it over.**

### 7. Social Trust

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<td><strong>Trust is vital.</strong> People will not act on information unless they trust it.</td>
<td><strong>Identify where and what the trust points are in a community.</strong> These must be leveraged to ensure impact.</td>
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<td><strong>Trust is variable.</strong> Crisis and recovery puts new stresses on trust that can make it hard to predict people’s reaction to information. It is also clear that trust of media and police depends on context. For example, television was residents’ most trusted source – except when it came to reporting on extreme weather events.</td>
<td><strong>Identify how trust shifts under stress and crisis.</strong> Always be cognizant of the assumptions upon which information strategies are predicated. Design strategies to support and reinforce trust points in communities.</td>
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<td><strong>Trust is often hyper-local.</strong> Networks of family and friends, in addition to personal verification of information, were the most trusted channels. Organizations with deep roots in the community were also trusted. For example, residents tended to trust hyper-local organizations such as Yellow Boots, Guyon Rescue, Staten Island Imagines, and others because they knew that the people helping them were from the community.</td>
<td><strong>Build trust.</strong> People trust organizations with deep roots in the community, and are not only more likely to share information with these organizations, they are more likely to act on information they receive. Building stronger support for emergent community organizations is critical.</td>
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- **Trust is the best motivator to action.**
  Information flowing toward people (whether TV, tweets, or police knocking on the door) did not move people to action; information personally exchanged or observed did (e.g. when danger was immanent and visible).

8. **Influencers**

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<td><strong>Information influencers exist.</strong> There are individuals/organizations in the community who consume and distribute information from the media and other sources and are important sources of information for their peers. The survey identified information influencers among the respondents: people for whom there was a significant positive correlation between perceptions of serving as an important source of news and information and the frequency with which they reported discussing or sharing news and information with members of their community. Using these influencers is a good way to increase reach and impact of information.</td>
<td><strong>Identify and target influencers.</strong> Understanding the complex set of factors that motivate individuals to be information influencers will increase understanding of how information flows can be improved.</td>
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<td><strong>Influence is variable and dependent.</strong> Different people, places, and organizations may be influential in different situations and for different types of information. Police who may have been influential at other times were had a hard time convincing people to leave their homes even when knocking on doors.</td>
<td><strong>Identify influential organizations and incorporate these in response.</strong> Hyper-local organizations have community influence – better connections between these and regional and national organizations would facilitate better information flows and stronger response and recovery.</td>
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<td><strong>Think about place.</strong> Identify physical spaces where information is sought and exchanged and leverage these.</td>
<td><strong>Assess what constitutes influence for a variety of situations and needs</strong> through research with communities. Human centered approaches can be a highly effective tool for this discovery.</td>
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A. The Information Ecosystem Framework

At the heart of the Internews Center for Innovation & Learning’s work is the vision that healthy information ecosystems are a root solution to furthering human progress. “Information ecosystem” describes how local communities exist and evolve within particular information and communication systems. Within these systems, different types of news and information may be received from outside then passed on to others—through word of mouth, key community members, phone, the Internet, and the like. The term broadly refers to a loose, dynamic configuration of different sources, flows, producers, consumers, and sharers of information interacting within a defined community or space. By understanding information ecosystems, policymakers and practitioners can design the most appropriate and effective strategies that can serve even the most information deprived communities and societies.

An information ecosystem is not a static entity; it is by nature constantly evolving and changing. Nor is an information ecosystem a discrete form; it can be defined at many levels, from global to national to community to interest-based groupings within communities. Any examination of an information ecosystem goes beyond traditional audience research on media access and consumption; it adds considerations of information needs, information creation, and information distribution as dynamic systems that adapt and regenerate according to the broader developmental challenges and needs of a given community. Information must move or it has no reason to exist; because it flows, it transforms as context and actors shift. Information is a defining aspect of human relationships; thus an analysis of trust and influence are critical to the study of information ecosystems. The framework is meant to be practical, and thus an examination of the use and impact of information is also essential.

We currently define information ecosystems as follows:

**Information ecosystems** are complex adaptive systems that include information infrastructure, tools, media, producers, consumers, curators, and sharers. They are complex organizations of dynamic social relationships through which information moves and transforms in flows. Through information ecosystems, information appears as a master resource, like energy, the lack of which makes everything more difficult.
B. The Eight Critical Dimensions of Information Ecosystems

In the first phase of the Embracing Change project, Internews undertook a literature review, an analysis of four case studies, and primary research on the cyclical floods of Jakarta, Indonesia. This research, together with Internews’ 30+ years of field experience, was crystalized into the **Eight Critical Dimensions of Information Ecosystems**. These dimensions are dynamic and in constant flux, interconnected and non-hierarchical.

Using the Eight Critical Dimensions as a lens for analysis, brings new perspectives to how community resilience is affected by strengths and weaknesses of these various components of its information ecosystem. Presented briefly here, these dimensions provide a framework for the New York research findings presented in Part II of this report. Further discussion of each dimension and some general principles that underpin each one can be found in Annex I. The Eight Critical Dimensions are a work in progress; as more research, refinement, and iteration take place, they will continue to evolve.
C. Information Ecosystems & Resilience

The provision and communication of good information is critical to anticipating, planning for, and ultimately responding to change. When people are supported by strong information ecosystems that allow them to access and exchange critical information, they can effectively adapt and flourish in response to more frequent and large-scale changes in their environment.

Information is the critical factor that allows communities to understand the complexities of their situation and respond appropriately. Timely and accurate information for populations, as well as strong and healthy information flows between communities, responders, and local media, allows communities to have a clearer sense of the challenges they confront, self-organize and take on responsibilities in response, participate in recovery and resilience efforts, and reach consensus on how to build back better. As such, information fosters the capabilities and aspirations of individuals and communities: it empowers people to take an active role in their own resilience in a sustained, systemic manner, while reducing dependency on external intervention that is typically only available for traumatic, large-scale events. Ultimately the critical element in resilience and response is always centered on affected individuals and communities. External support is of course useful and often essential, but true resilience is always from the ground up.

While our research demonstrates that a systemic perspective on information is largely absent from resilience policy and practice, a review of Rockefeller/Arup’s “City Resilience Framework” indicates that healthy information ecosystems are already an implicit cornerstone of resilient cities and systems. The City Resilience Framework helps us to precisely analyze the linkages between dimensions of information ecosystems and qualities of resilient systems (see Annex II for the Qualities of Resilient Systems). It is clear from the Qualities of Resilient Systems that healthy information ecosystems are implicitly critical to resilience, Internews argues that it is important to make this element explicit and to better understand its dynamics.

Without healthy information ecosystems, articulated goals and characteristics of resilience simply cannot be achieved. If governments, donors, investors, policymakers, and the private sector hope to foster resilience by understanding dynamic networks of control, influence and power and ensuring inclusion of all social groups and neighborhoods, systematically assessing and supporting the information ecosystem within a given community or place is fundamentally important.
Similarly, the City Resilience Framework identifies resource coordination, collective action, social cohesion, social networks, and effective communications systems as key features of resilient cities and systems (to name just a few). These ambitions cannot be achieved solely through technology or tools, but must also rely upon strong, redundant, and trusted information flows and relationships that underlie and sustain day-to-day life within a community. Simply put, a community with a strong information ecosystem is a more resilient one.
Practitioners often describe the resilience perspective as bringing together development and disaster risk reduction (DRR), two perspectives which have been functionally separate for decades but which in fact are fundamentally intertwined. Looking holistically and systemically at communities’ experiences with stressors, shocks, and acutely disruptive events teases out connections between poverty and humanitarian disaster, which in turn identifies a range of ways to strengthen communities’ ability to adapt to change.

The New York case study presented in this report was preceded by an investigation of how the Information Ecosystems framework might strengthen understanding of resilience in Jakarta, Indonesia, a megacity in a country with rapid growth and declining poverty, a relatively stable and democratic government, and extreme vulnerability to climate events. Indonesia is on the receiving end of international aid and humanitarian assistance (including implementation projects by Internews), and is thus perhaps not a surprising choice for such a study. The New York case study research built upon key lessons and findings from the Jakarta study.

**Why study New York?**

The majority of Internews’ work is international; however, for the second phase of the project, Internews turned to the United States in the spirit of an evolving global perspective that sees the world holistically rather than divided into developed and developing nations (for example, the new UN-led Development Agenda after the 2015 Millennium Development Goals will apply universally, not just to developing nations).

The project team first considered New Orleans as a case study, where Internews had been developing an experimental project since 2013. Yet, in the interest of researching the aftermath of a significant event in recent memory, New York City’s information ecosystem in the context of Hurricane Sandy, particularly in Brooklyn and Staten Island, was selected instead. In keeping with the resilience framework, the study looked not just at the acute event, but also explored aspects of the recovery period since the storm. The research soon revealed striking similarities between New York City and Jakarta, both in the historical development of DRR and in some features of each city’s Information Ecosystem. A final section highlighting striking parallels across the two cities is featured at the end of Part II.
Hurricane Sandy: a major shock to the system

Hurricane Sandy hit the eastern seaboard of the US on October 22, 2012. According to the Federal Emergency Management Agency (FEMA) in the region, more than 23,000 people were uprooted and forced into temporary shelters and roughly 8.5 million households lost power. The Centers for Disease Control reported a total of 117 hurricane-related deaths, the majority of which occurred in New and New Jersey; the most common cause of death was drowning. Tragically, approximately half of the drowning deaths occurred in flooded homes located in areas under mandatory evacuation. A better understanding of how communities’ information ecosystems function can shed light on whether and how people received information to evacuate, how they evaluate it, and what led them to act on it (or not).

New York Information Ecosystem

The information ecosystem of New York City is dense and complex. New York is the largest media market in the United States, served by 20 broadcast television stations, two city-specific cable news networks, five major daily newspapers, and with over 100 radio stations serving the area. With the city’s tremendous ethnic diversity, a wide range of foreign-language media outlets serve the region, including multiple daily papers published in Chinese, Spanish, Polish, Greek, and Korean, as well as a wide range of foreign language broadcast media. Each New York City borough (Brooklyn, the Bronx, Manhattan, Staten Island, Queens) is served by more localized daily and weekly newspapers, radio stations, and community access cable channels. It is one of the most connected cities in the world; 98% of residences have broadband connectivity. The city is also investing in digital capacity building of its residents. One of the most densely populated areas in the US, New York City has relatively few single-family homes and relies heavily on public transportation – structural characteristics that amplify more traditional forms of communication such as word of mouth and public billboards.

A review of policy literature prior to the field research revealed that information inadequacies were central impediments to effective planning and responding to Hurricane Sandy. Fundamental information resources, such as FEMA’s Flood Insurance Rate Maps for New York, had not been updated since 1983. The inadequacy led to a critical flaw in city planning materials: half of all impacted residents, and over half of all impacted buildings, were located outside of the floodplain designated on the FEMA maps. While New York is one of the most connected, media-dense cities in the world, widespread power outages dramatically undermined the efficacy of many vital communications technologies, such as television, radio, and the Internet. Out-of-date information resources and lack of redundancy in information infrastructures were two of the weaknesses in New York’s information ecosystem. It appears as if New York City was caught off guard, unprepared for such a catastrophic event and its long recovery. Even as one of the most developed and advanced cities in the world, New York still needs the political will and ability to prepare for the unpredictable next big storm.

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The following narrative highlights key observations from the Information Ecosystems pilot research study investigating the features of New York’s information ecosystem during and after Hurricane Sandy along the Eight Critical Dimensions of Information Ecosystems. While not an exhaustive analysis of each Dimension, this summary presents new perspectives elicited by the information ecosystem framework. The design and analysis of the study builds on the initial findings of the Jakarta Information Ecosystem Pilot summarized in “Why Information Matters.”

**Research Methods**

The research, conducted in June and July 2014, took a mixed methods approach, employing a survey across Staten Island and areas near the water in Brooklyn, together with focus groups of affected populations in these two boroughs, in-depth interviews of community and city leaders, and observations. A summary methodology can be found in Annex III. The full methodology, including discussion guides and survey instruments, will be available in a report presenting detailed findings from the study, available in December 2014. Staten Island and Brooklyn were chosen as two areas that were highly affected by the storm, but somewhat distinct from each other in terms of demographics and dominant housing type. Brooklyn has a much larger population (over 2.5 million vs. Staten Island’s less than half a million), that is much more diverse. The dominant housing type in Brooklyn is apartment buildings, as opposed to single-family homes in Staten Island.

Mapping Information Systems to Support Resilience: A Decision Support Tool (the companion to this report) offers a methodology of assess, analyze, act, and iterate to help those who use it to understand a community’s unique information obstacles, challenges, and needs. Following this approach, the discussion below offers a summary of findings from data to assess each dimension, possible ways to analyze the challenges and gaps, and recommendations for people to act in order to strengthen each dimension of the information ecosystem. Once suggestions on how to act are tested, it is recommended that decision-makers iterate, based on the initial impact of their actions.

A tree in Brooklyn felled by Hurricane Sandy, courtesy of a focus group participant.
1. Information Needs

**Key Questions**
Do communities have access to the information that they need related to stresses and shocks?
Do responders have accurate and timely information?

**ASSESS**

**Information Deficits: Content, Pathways, And Access**
In New York during and after Hurricane Sandy, official information sources such as government agencies and news outlets did not provide information that local communities most needed and found relevant. The information agenda was too broad or sensational; for example, repeated basic warnings to stay indoors before the hurricane, and after the storm, repetitive coverage of the devastation and heart-rending human-interest stories. Many residents believed that official sources failed to meet their needs for practical, actionable information such as:

- how to prevent damage to their home or property
- where to go for information on obtaining assistance
- the status and schedules of public transportation services
- options for obtaining shelter; and
- (as the recovery process progressed) which contractors rebuilding homes were engaging in fraud or price gouging.

**Information blackouts impede empathy for affected people**
Some affected neighborhoods were absent entirely from reporting and news coverage, resulting in “information vacuums.” Both Brooklyn and Staten Island residents in the focus groups noted that the news media neglected to report on the impact of the storm on their neighborhoods. This information darkness was so complete that some residents recounted that when they finally returned to work, some of their co-workers did not believe that their neighborhoods had suffered extensive damage. Residents speculated that these information vacuums may have been the result of infrastructure damage that prevented news crews from reaching their neighborhoods. Whatever the cause, the result not only impeded residents from learning about happenings in their own neighborhoods, but it also excluded them from public recognition of their difficult experience. Individuals and communities have a human need for their struggles to be understood and recognized by others, and a need for empathy.

**ANALYZE**

- The right information was not available. There was a disconnect between information people needed and what was available to them. Official sources such as media and government did not provide communities with sufficient actionable, useable information.
- Lack of representation in the media. Mainstream media failed to provide a hyper-local, inclusive perspective, leaving big gaps in the public narrative of how the storm impacted individuals and communities.
ACT
• Investigate information needs using a broader range of approaches. Use a human centered approach; this means moving beyond assumptions and uncovering people’s actual needs.
• Include different groups and communities’ voices as a priority at the planning stages. An understanding of what kind of information communities seek, and where they seek it, will help in the design of programs to meet information needs.
• Empower through visibility. People needed their experiences to be seen and heard through media. This would be a meaningful and powerful validation of their own difficult experiences.

2. Information Landscape

Key Questions
What infrastructures support information production and flow?
What capacities do information providers possess to verify, filter, sort and disseminate information?
How does information flow across different stakeholder groups? What are the factors affecting healthy flows?

ASSESS
Information ecosystems exist at many scales, from the world, to a country, to an organization, to a small group of individuals such as a family; there are many potential frames by which to analyze the system. In the same way that the scale of perspective changes when a camera lens opens and closes, we can frame and re-frame different perspectives on the information ecosystem of New York City. New York City is unique in that it is comprised of five distinct boroughs separated by waterways, which serve as significant transportation bottlenecks and boundaries of sorts. Each borough possesses its own distinctive populations, and each of the boroughs function, to some extent, as distinctive, self-contained cities in their own right. New York is also a city with strong neighborhood identities, with each neighborhood operating as distinct information ecosystems.

Information ecosystems constantly adapt and change
New York City’s complex information ecosystem shifted significantly in the wake of Hurricane Sandy. Significant parts of the landscape were damaged as a result of extensive power outages; there were downed antennas, phone/cable lines, and cell towers; and flooded transportation infrastructure and facilities. According to a survey conducted by AP/NORC, approximately half of the residents living in the affected region experienced cell phone
outages. Thus despite the density and reach of all types of media in non-crisis circumstances, storm damages pushed residents to rely on neighborhood networks for information and assistance. Survey respondents most frequently identified their neighbors as a source of immediate assistance during and after the storm. As a result of the storm, the information landscape shifted significantly, from an information rich media mecca to a much more localized, personal relationship-based structure.

In Brooklyn (where residents are much more likely than in Staten Island to live in apartment buildings), the information ecosystem of critical importance was that of the residential building, a distinct community in its own right. Research participants affected by Hurricane Sandy frequently identified the action—or inaction—of those within their buildings as vital to the response and recovery process. This included those responsible for building maintenance and/or governance, as well as other building residents. The health of the building’s information ecosystem could be judged, for example, by how quickly and efficiently building leadership (landlords, co-op boards) reached out to and coordinated with insurance providers and effectively engaged with contractors conducting repair work.

Infrastructural characteristics of each building also impacted information flow throughout the building’s ecosystem. For example, whether or not a building had a back-up power generator emerged as an important factor in residents’ assessment of the resiliency of their immediate community. However, information flows within the building depended on more than infrastructure; the extent to which building residents helped one another, in terms of sharing information and resources, was an equally critical factor in the robustness of the information landscape. Residents of higher, unflooded floors frequently housed those whose lower-floor apartments had been flooded, and at times were instrumental in facilitating information flows.

Innovation during a changing information landscape: hyper-local organizations

Further emphasizing the importance of a hyper-local perspective, local organizations—particularly churches—were highly effective in providing rapid and responsive disaster assistance. In Brooklyn, for instance, according to Reverend Michael Sniffen, the Church of St. Luke and St. Matthew collaborated with local Occupy Sandy members to establish and

Daniel (a pseudonym), from Brooklyn, became an accidental information hub: he possessed one of the only corded landline phones in the building. Power outages and cell phone tower damage meant that only these “outmoded” phones were operational; Daniel’s phone became an important shared resource for residents of his building.

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maintain a relief and recovery effort that ultimately enlisted, trained, and coordinated almost twice as many volunteers as the Red Cross did for the entire tri-state area. This massive differential in successful volunteer recruitment suggests that tremendous inherent capacity lies within locally-based social networks and community based organizations.

It was widely recognized – even by those in city government – that community-based response organizations tended to be more rapid and flexible in their response, as they were able to act based purely on observed need, freed from many of the constraints that arise from bureaucratic structures and from the liability concerns that can limit the range and speed of activities by large public agencies or national relief organizations. Most Occupy Sandy participants were young and technology-savvy, communicating and organizing their activities via social media. As Reverend Sniffen explained the rapid response and effectiveness of his group’s relief effort as a function of the fact that they were “an improvisational group with no bureaucracy.” In Brooklyn, churches and Occupy Sandy members took on the distribution of supplies to residents in need for larger organizations such as the Red Cross. The example of Occupy Sandy collaborating with the Red Cross exhibits positive deviance: effective solutions that deviate from the norm but may not be widely adopted. This and other examples of positive deviance should be examined more closely to better understand how radically different types of organizations can communicate and collaborate.

While there were some important instances of collaboration and cooperation between local and regional organizations, disconnects and disruptions in the flow of information between these organizations was a persistent problem. New York City representatives highlighted the communications challenges inherent in collaborating with a non-hierarchical organization like Occupy Sandy, in which specific individuals generally were not assigned specific roles or leadership responsibilities but instead circulated across different roles. This meant that in some instances, information had to be repeated to each new individual who took on a particular role/responsibility at different points in time. National agencies such as FEMA had a difficult time overcoming these challenges and did not effectively connect and collaborate with hyper-local and grassroots responses to Sandy.

Still lacking: coordinated, inclusive planning

It appears that, even now, parallel disaster preparedness plans are being written at the national, regional, and local levels without any substantive cross-communication at the hyper-local level or with emergent response organizations formed in the immediate aftermath of the storm. Even two years after Sandy, communication and coordination disjunctures across local, regional, and national organizations have not yet been effectively recognized and resolved. This speaks to the need to start with the community. Planning systems must be demand-led...
rather than supply-led to tap into both real needs and hyper-local capacity to innovate during shocks to the information landscape.

ANALYZE

- During Sandy, primary information delivery infrastructure no longer functioned. Pervasive power outages and downed cell phone towers transformed the information landscape.
- Older technologies may be more robust. Community members and neighbors at the most hyper-local level re-appropriated outmoded technology as they collaborated with and assisted one another.
- Local organizations may be critical partners in effective communications. Overall, well-resourced national organizations failed to leverage the advantages of local, innovative organizations.
- Information flows between local and regional levels often ineffective. Information delivery systems focused primarily on information needs that were determined without community input.

ACT

- Conduct a thorough, periodic assessment of all communication systems used by populations – not just main information sources. The secondary and other sources provide the basis to design robust, redundant systems and create multiple alternate strategies to reach local populations.
- Assess the relative sensitivities of different information delivery systems to different disruptions. What are the most resilient systems? Include these as a key element of the information communications planning.
- Increase understanding of how extemporaneous, non-hierarchical organizations intersect with more traditional organizations, and incorporate these elements in communications strategies.
- Improve information flows and communications. Challenges in information flows across national and local organizations and communities should be diagnosed and addressed.

3. Production and Movement

Key Questions

How robust are the variety of types of information available?  
Who produces and distributes information? Who owns information resources?  
What is the role of internet and mobile media? What is the role of word of mouth, social media, bulletin boards, local information hubs?

Adam Kaufman, who served as Manager of Operations Logistics for NYC Service for the four months immediately after Hurricane Sandy, noted that one of his first coordinating tasks was to consolidate into a single map four different damage/need assessment maps being maintained (and acted upon independently) by organizations ranging from the City of New York, to Habitat for Humanity, to a Christian charity.
ASSESS
Community resilience in the face of a disaster such as Hurricane Sandy is in part dependent on how well the community can effectively produce and disseminate necessary information to those who most need it. Hurricane Sandy was the first disaster to affect New York City in the social media age, and as such, presented a scenario in which the dynamics of information production, dissemination, and consumption had the capacity to be radically different from previous events (e.g., September 11th 2001). Social media did in fact play a significant role in the production and dissemination of news and information, but it was not the only factor. Although social media in many instances facilitated response and recovery, basic challenges such as information coordination across organizations persisted.

Community organizations used social media to produce and distribute information in innovative ways
Both formal and emergent responders benefited from the use of social media as a broadcast platform both for affected individuals to communicate their status and for emergency messages to be shared and redistributed. Social media platforms enabled rapid and extensive information dissemination at the individual level to an extent not possible via traditional media. Individuals affected by the storm were able to disseminate their status and needs via social media, and response organizations were able to gather this information and respond accordingly. Guyon Rescue, a Staten Island-based non-profit focused on Hurricane Sandy recovery assistance, for instance, found social media to be enormously helpful in recovery efforts. According to Derek Tabacco and Karen Torrone, the co-founders of Guyon Rescue, social media acted as a “central database” that facilitated information gathering, dissemination and activity coordination, and became tightly integrated into their organizational strategy. It also acted as both an information repository for resources and as a way for friends, families, and neighbors to identify the areas of greatest need for donations and resources.

Delivery of gasoline was coordinated via expressions of need that residents posted on Facebook.

The Guyon Rescue disaster assistance trailer, still in operation as of the July 2014 Pilot research. Photograph by Jack Harris.
The Department of Homeland Security\(^5\) argued Occupy Sandy was able to deploy more volunteers than the Red Cross because it integrated social media with a horizontal organizational structure to create a long reach to hard hit communities. Social media was used in several instances of community-led response. Although it is often seen as a tool for connection across distance, in these examples the community used it in creative ways that were appropriate for them: as a localized communications tool and data repository.

In recognition of the importance of social media and the value of digital tools, the Church of St. Luke and St. Matthew in Brooklyn, in collaboration with members of Occupy Sandy, established a 20-25 person communications hub to facilitate coordination and decision-making processes such as who to send relief to, and how and when to send it. The church (located in a relatively unaffected area of Brooklyn), purchased wi-fi hot spots in order to have sufficient bandwidth for the communications team (each equipped with a laptop) to engage in activities ranging from: establishing and maintaining an online portal for recruiting, registering, and categorizing (based on skill sets) volunteers; receiving phone calls from residents in need and maintaining an online database of those needs; handling shipping orders for supplies; and engaging with the press.

The role of social media in strengthening information flows during Sandy received a lot of coverage in the mainstream press; however, there were challenges. Maintaining social media contact was difficult in the face of power outages and damaged cell towers. Even when social media functioned, it was not an inclusive tool: in neighborhoods or buildings with primarily elderly residents, for example, the flow of information to and from these communities via social media was minimal. Disparities across communities in terms of their access to and use of social media created the danger of responder attention and resources being disproportionately, inefficiently, and inequitably allocated. Some organizations, like the National Guardsmen, tried to fill these gaps with door-to-door observation of damage and word-of-mouth communication. NYC Service printed and physically distributed flyers printed in up to 13 different languages on topics such as garbage pick-up schedules.

Beyond social media, an important challenge in the production and movement of information was the lack of centralized information resources. Some information was just not available when and where it was needed, including important sources of documentation and data vital to the recovery process for example, property titles.

\(^{5}\) See report, The Resilient Social Network @OccupySandy #SuperstormSandy
Some respondents argued that 311, the city’s phone number for government and non-emergency information, was an important central hub for gathering information about residents’ needs. However, it was just one of many independent channels (including social media) that residents used to ask for help. Not only was information not centralized; key channels of information about the status of neighborhoods were not coordinated. Because of a lack of centralized and coordinated information about damage, needs, and response, multiple examples of waste and redundant response efforts emerged. For example, Manager of Operations Logistics for NYC Service Adam Kaufman recounted consolidating into a single map four different damage/need assessment maps being maintained (and acted upon independently) by organizations ranging from the City of New York, to Habitat for Humanity, to a Christian charity.

**ANALYZE**

- Information for communities did flow but with varying levels of effectiveness. There were both successes and failures in responders’ ability to produce and disseminate needed information to affected communities; likewise in their ability to process information from communities.
- Social media was an effective tool as both information delivery support and in connecting individuals and groups. Beyond information creation and dissemination, social media was repurposed to coordinate relief and in the process also strengthened social ties.
- Social media was technically quite vulnerable to disruption and did not reach all groups within affected communities.
- Information systems were not coordinated or centralized.
- Affected populations were not adequately informed of how /who to communicate with and what information was needed from them.

**ACT**

- Using multiple methods to create and disseminate information improves flow and impact. Processes of production and movement are dependent not only on new tools for information sharing, but also on leveraging and integrating existing information dissemination practices.
- Coordinate information content and dissemination strategies.
- Identifying what types of information need to be produced and multiple ways to share and receive information as a periodic practice will not only help prepare for a crisis, it can create new and more robust information flows across organizations and communities.
- A strategy to support more robust social media systems for data capture and distribution (leveraging systems that are already in place) is also needed.
- Social media can be useful for community engagement, but inclusion of all groups is not possible without a communications that go beyond social media. It is important to identify what groups are left out of social media strategies and how to include them.
- Effective information gathering and dissemination amongst recovery organizations should be coordinated where possible. Not only will this avoid duplication of efforts, it will assist in prioritization and identification of unmet needs and strategies to meet these.
• Create robust open channels of communications to and from affected communities – constant dialogue is essential. This is not a one-way process.

4. Dynamics of access

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ASSESS
Understanding how individuals and organizations access the various information platforms and tools available to them in times of crisis is essential to understanding the role that information plays in community resilience. Severe environmental conditions during Sandy had a powerful impact on information infrastructure, and thus on access to and use of available information platforms.

Basic tools are often more resilient
Strikingly, it was often the older communications platforms that enabled better access to information at the hyper-local level. Similarly, another resident explained that his insistence on maintaining a television with rabbit ears (due to his refusal to pay for an additional cable box) paid dividends when his power returned, but his cable service remained disabled. Others relied on transistor and HAM radios in order to obtain and disseminate information. In the aftermath of Sandy, flyers and posters served as an important means of disseminating information (about issues such as bus and train schedules, trash pick-up, etc.) through communities. The trucks and cars that delivered relief supplies also served as an important means of disseminating information across affected areas. Finally, face-to-face communication was a vital means of sharing and obtaining information, with relief centers and community charging stations serving as important information hubs. Revitalization of older modes of communication helped to combat what Laura Del Prete-Gonde, of Community Organizations Active in Disasters, described as “cascading information failures.”

ANALYZE
• Severe environmental events had unanticipated effects on communities’ accustomed access points for information. Newer media requiring electricity was not functioning
while some lesser-used, older forms of communication (such as corded landlines) became highly relevant.

ACT
• Design communications and information management systems that include a range of alternate and linked delivery systems – pay attention to “older” technologies that may be less susceptible to disruption. Lower tech systems are always needed to provide a deep bench.
• Conduct proactive ongoing assessments of how communities access information, and what the relative strengths and weaknesses of different platforms are during crisis. This can lead to more robust design for some platforms and the creation of more effective redundancies.

5. Use

Key Questions
Is information perceived to be relevant?
What do people do with information?
How is information processed, disseminated, and applied?

ASSESS
Understanding information usage within a community means understanding who uses what sources, and which are perceived to be relevant. Understanding which information sources are relied upon most is vitally important, particularly as new technologies and platforms are rapidly being introduced into the information ecosystem.

Residents turned to traditional news sources during disruption
Surprisingly, the survey showed that residents relied on the same primary sources of information both during and after Sandy. That is, the hurricane itself, and the disruption it caused to various communications infrastructures, did not seem to significantly impact where residents turned for information. What is perhaps even more surprising is the dominant role that television served, both during and after Sandy, with just over 50 percent of the respondents reporting that television was their primary source of news and information. Newer communications platforms such as websites and mobile applications were mentioned by fewer than ten percent of the respondents as their primary source of news and information (again, both during and after Sandy). These patterns are likely a reflection of the average age of the residents of the communities surveyed; the average age of
the survey respondents was 50 years (reflecting the overall population), and older individuals are generally less likely to rely upon newer platforms for their news and information. Even when we compared the responses of people under 40 with those over 40, the younger group only relied on internet and social media about 10 percent more than their older counterparts.

By comparison media reporting did not accurately reflect this situation. Analysis of news reporting during and after Hurricane Sandy related to information flows and usage found an overwhelming emphasis on how people were using social media platforms. Despite media skew and an emphasis on the promise of social media in our qualitative findings, television was still the most significant source of information across the two populations in this study.

**ANALYZE**

- Television and radio are still the most accessed information sources for both younger and older people. Traditional media such as television and radio have yet to be displaced in a dramatic way, and appear to continue to serve as the most important information sources for many New Yorkers, both older and younger.
- However, television access broke down under extreme conditions.

**ACT**

- Reality check - it is important not to embrace exaggerated notions of the usage or significance of newer communications platforms. They deserve attention and further development, but not at the expense of the platforms that are used most by the population.
- Mass media such as television broadcast should be included as a prime information management tool. Programming should be responsive to community needs, and incorporate a range of aspects beyond more conventional news, weather, etc. A more sophisticated conception, construction, and management of television broadcast is needed to withstand future stresses and shocks.

### 6. Impact of Information

**Key Questions**

- What are the short and long term impacts of how people use information?
- How does information inform community members’ decision-making?
- How does information inform government and other responders’ decision-making?

**ASSESS**

One of the basic ways in which we might anticipate that information after the storm would have an impact is on community preparedness. That is, did people act on information about preparing for the next acute weather event? In Brooklyn and Staten Island, a healthy majority of 65 percent of survey respondents indicated that they personally are as prepared for the next weather-related emergency as they should be. Respondents could clearly and correctly identify
specific preparedness actions (i.e. formulating a personal or family evacuation plan, and preparing a disaster emergency kit or bag, which are top action items identified by the Red Cross), demonstrating that people had received and remembered some preparation information. However, despite having this knowledge and expressing that most considered themselves personally prepared, 51 percent of survey respondents indicated that they had taken no action at all. Thus in terms of personal preparedness, there is a wide gap between accessing information use and acting on information. This illustrates a critical aspect of information flow – it is not enough to simply ‘reach’ or even engage with a communication. To truly have impact information must necessarily be crafted and delivered in a way that ensures the maximum potential for impact and hence action.

It is also worth noting that people did not perceive preparation measures that would facilitate better communication with the community and beyond (such as having a having a spare charged phone) to be important.

CASE STUDY: LOCAL INNOVATION

Information that is actionable, has immediate or near-term effects, and that is disseminated in a way that is conducive to response, can have a substantial impact within a community. The collaborative work of the Church of St. Luke & St. Matthew and the members of Occupy Sandy in Brooklyn illustrates this impact. Together, they established a system in which Amazon.com’s gift registry platform was used to create an inventory of needed items for residents affected by the storm. This information was disseminated by social media so that individuals interested in donating money to help those affected by the storm could utilize the registry platform to purchase needed items. These items were then delivered to the church, and then volunteers delivered the goods by any available means (vehicle, bicycle, on foot) to the residents in need. UPS drivers obtained permission from the company to use the company’s trucks on their days off to assist with deliveries. The system was so successful, that the bulk of the church’s space ultimately was used as a warehouse for the supplies being delivered from Amazon. This online/offline donation and distribution system is a rich example of an innovative, community led solution, not something imposed externally.

Below, a photograph of the church being used as a warehouse. Photograph courtesy of the Church of St. Luke & St. Matthew, Brooklyn.
Impact can also be seen in the ways in which new information platforms gave rise to new organizational forms of disaster response. The flat, decentralized, volunteer-based organizational and decision-making structure of Occupy Sandy illustrates this dynamic. Occupy Sandy member Goldi described volunteer response as “like an unstructured swarm” and viewed Occupy Sandy’s role as “making the swarm efficient.” Community leaders believed that such an organizational structure could not be effectively coordinated and utilized were it not for the wide range of social media tools that were utilized in its operation.

ANALYZE
• Delivery and engagement with information does not necessarily mean impact and response. Affected populations digested information about preparing for emergencies – but did not necessarily take appropriate action.
• Actionable information that is well disseminated and coordinated has impact. It allows for efficient collection and distribution of relief items, and can increase integration between local organizations and national companies.
• Unstructured organizations can re-appropriate social media and have positive impact. When social media is effectively used to coordinate a flat, decentralized organization, response to those in need can be observably increased. Centralized information and creative, flexible use of multiple information platforms by a widely dispersed / networked group of people, with lots of information touch points, worked well for Occupy Sandy.

ACT
• Provide information in the right form, via the right channels and at the right time. Research and understand what constitutes impact for different communities using more human centered approaches. Devise appropriate communication and information creation strategies that address elements such as trust and influence to increase potential for response and action.
• Investigate how to improve and evolve support emergent innovation (such as that of Occupy Sandy) – without imposing or taking it over.

7. Social trust

Key Questions
What are the dynamics of trust within communities?
(How) does trust nurture resilience? (How) does the lack of trust impede resilience?
What are the challenges around trusting weather-related information?
Trust is an important factor influencing if and how individuals respond to information. Eliciting trust patterns can also help in understanding how a community adapts and responds to change.

People seek out – but mistrust – television weather reporting
In focus group discussions, participants almost universally expressed cynicism and skepticism towards mainstream news media’s (particularly television) weather coverage. People felt that they had been misled numerous times in the past about the severity of impending weather, with the coverage being described as “overhyping” or “blowing out of proportion” the severity in a calculated effort to increase ratings. Ultimately, one resident concluded, “most of us suffered because we didn’t pay attention.” Since television is the news source people rely on the most, the lack of trust about weather reporting was clearly a significant impediment to residents taking appropriate action in advance of the storm.

Because of this mistrust, when residents learned about the storm on the traditional news media, they engaged in a verification process through alternative, more trusted, information sources. This verification process included actions such as consulting online information sources (such as those provided by government agencies), and reaching out to friends and family members by telephone. Friends and family received the overall highest trust ratings in the survey, with 86 percent of respondents indicating that they either strongly or somewhat trust their friends and family as news and information sources. Focus group participants described how they verified news reports by personal experiences and direct observations. In Staten Island, for instance, many residents reported using their cars to explore, assess, and verify first-hand the state of their community and their surrounding communities in the wake of Hurricane Sandy.

People’s mistrust in television, interestingly, is specifically related to weather reporting. Approximately 80 percent of the survey respondents indicated that they trusted television news (either strongly or somewhat). In New York, it seems, the traditional news media lack credibility not in general, but rather in relation to weather reporting. People’s distrust of the weather reports of their primary source of information helps to explain why so many New York City residents did not act, despite multiple reports urging them to evacuate or take other safety measures.

Official sources also had difficulty moving residents to act with information about the impending storm. According to Darrell Hayes, Staten Island Coordinator for Long-Term Recovery for the Episcopal Church, who was a NYC Police Sergeant at the time of Sandy, police had little success when circulating through neighborhoods in police cars, disseminating storm information and evacuation instructions over loudspeakers. Eventually, the officers began traveling door to door, in an effort to convey the severity of the impending storm and to encourage residents to evacuate, but again they were not particularly effective. Even though interpersonal communications are more often trusted, this is not necessarily the case during
times of stress among people who do not know each other. Many residents did not evacuate until the last minute, when danger was imminent and directly observable.

Residents expressed similar distrust for storm information disseminated through social media. Focus group participants’ descriptions of online platforms such as Facebook and Twitter range from “a source of misinformation” to something to be “completely ignored.” However, residents frequently described the importance of social media for disseminating their own status to friends and family, as well as broadcasting their need for help. The news reporting surrounding the role of social media during and after Sandy also emphasized its perceived unreliability as a source of storm information. For example, media reported on fraudulent social media reports that the New York Stock Exchange had been flooded.

Issues of trust also arise in efforts to gather and disseminate information in the wake of the disaster. Google sought to update its Google Street View application by taking photos of neighborhoods affected by Sandy in January 2013. This angered some Staten Island residents, who felt Google’s actions would further depress property values. Others were concerned about the image of devastation that would be projected to the rest of the world. Google defended its actions as an effort to “help people around the world better understand the extent of the damage and the importance of coming together as a community to aid in the recovery efforts.” an effort which some Staten Island residents appreciated.6

Community organizations were trusted
Organizations with deep roots in the community were quick to gain the community’s trust in the response and recovery. Malachi Hindle of the Saint Bernard Project noted that when emergent groups arose in response to the storm (hyper-local organizations such as Yellow Boots, Guyon Rescue, Staten Island Imagines, and others), residents’ knowledge that the people helping them were from the community enabled them to trust the aid and the process. This trust facilitated their providing information, and made them more likely to act in response to the information that they received. In some cases, the larger, more established organizations were seen as part of the problem, standing between the homeowners and the help or relief they needed.

ANALYZE
• Trust is vital. People will not act on information unless they trust it.
• Trust is contextual. Crisis and recovery puts new stresses on trust that can make it hard to predict people’s reaction to information. It is also clear that trust of media and police depends on context.

• Trust is often hyper-local. Networks of family and friends, in addition to personal verification of information, were the most trusted channels. Organizations with deep roots in the community were also trusted.
• Trust is the best motivator to action. Information flowing toward people (whether TV, tweets, or police knocking on the door) did not move people to action; information personally exchanged or observed did.

ACT
• Identify where and what the trust points are in a community. These must be leveraged to ensure impact.
• Identify how trust shifts under stress and crisis. Always be cognizant of the assumptions upon which information strategies are predicated. Design strategies to support and reinforce trust points in communities, and to build stronger ties with communities.
• Build trust. People trust organizations with deep roots in the community, and are not only more likely to share information with these organizations, they are more likely to act on information they receive. Building stronger support for emergent community organizations is critical.

8. Influencers

Key Questions
At the very local community context, who is influencing how information flows?
How does disruption impact these influencers?

ASSESS
Understanding what individuals and which organizations influence the flow of information and whether or not people act upon it is an essential component of assessing how to improve the impact of information. Each community has individual information leaders who could potentially play key roles in strengthening community resilience. Analyzing the survey data, we found that people who perceived themselves as important sources of news and information in their communities actually acted in this way. There was a significant positive correlation between perceptions of serving as an important source of news and information and the frequency with which respondents reported discussing or sharing news and information with members of their community. The survey results also suggest that people who perceive themselves – and act – as important sources of news and information in their communities are also more active consumers of news and information across an array of media platforms.

The hyper-local, community level information ecosystem is the backbone of effective information flows. Local influencers are key.
To try to gain a deeper sense of why they played this role we also talked with a select number of individuals who self-identified in the survey as important sources of news and information in their communities. Responses ranged from the very practical – such as higher levels of English language proficiency than other members of their community; to the more personal – such as identifying as an engaged citizen, or as being inherently more skeptical than other members of the community. These responses point us toward a complex, idiosyncratic set of factors that motivate information leadership in communities.

The hyper-local, community level information ecosystem is the backbone of effective information flows. Local influencers are key as they are best able to discern what information is valuable and can capitalize on trusting relationships to disseminate it. At the organizational level, hyper-local organizations are effective information influencers. Derek Tabacco of Guyon Rescue emphasized that in Staten Island the local and grassroots organizations have collected and organized extensive amounts of information about impacted residents and neighborhoods. He noted, “We have an understanding of who has the most need.” This understanding, together with community roots, builds trust. As we saw in the section on Social Trust, communities tend to trust and act on the information given by such organizations.

**ANALYZE**

- Information influencers exist. There are individuals/organizations in the community who consume and distribute information from the media and other sources and are important sources of information for their peers. Using these influencers is a good way to increase reach and impact of information.
- Influence is variable and dependent. Different people, places, and organizations may be influential in different situations and for different types of information.

**ACT**

- Identify and target influencers. Understanding the complex set of factors that motivate individuals to be information influencers will increase understanding of how information flows can be improved.
- Identify influential organizations and incorporate these in response. Hyper-local organizations have community influence – better connections between these and regional and national organizations would facilitate better information flows and stronger response and recovery.
- Think about place. Identify physical spaces where information is sought and exchanged and leverage these.
- Assess what constitutes influence for a variety of situations and needs through research with communities. Human centered approaches can be a highly effective tool for this discovery.
Parallels: New York and Jakarta

Why Information Matters synthesized research to propose a framework for analyzing an information ecosystem. Preliminary research was conducted in Jakarta, Indonesia to trial the framework and discover what new insights could be gained about why and how information ecosystems matter for resilience. Subsequent research in New York, summarized above, yielded even further insights about both the utility of the framework and how communities adapted to change during and after Hurricane Sandy.

Beyond the highly contextualized findings for each Pilot study, the research in Jakarta and New York yielded unexpected parallels between the two cities. Policy literature revealed that neither country has yet integrated development and Disaster Risk Reduction (DRR) policy and practice into a truly resilient system. Neither country has exhibited the Resilient Quality of reflectiveness; people and institutions do not “examine and systematically learn from their past experiences, and leverage this learning to inform future decision-making.” Instead, in both countries, DRR policy has developed in a reactive way over time, attempting to self-correct in response to the lessons from crisis but without being ready for future decision making that takes into account “the inherent and ever-increasing uncertainty and change.” Structured by the Eight Critical Dimensions of Information Ecosystems, a brief review of parallels between Jakarta and New York City unveiled by desk and field research highlights recommendations and opportunities for mutual learning. Brief observations are offered synthesizing these similarities and analyzing their capacity vis a vis the Qualities of Resilient Systems.

1) Information Needs: Both in Jakarta during the floods, and New York during and after Hurricane Sandy, the news media relied upon the most (television in both locations) did not provide information that local communities most needed and were interested in. In both cases, people complained that the information provided by television broadcasts was too broad or sensational. Further, research found no information needs assessments conducted with communities either in Jakarta or New York (nor familiarity with the concept). These gaps resulted in both locations in a dearth of actionable information that people needed.

Observation: In two cities well-known for their use of social media, television is still considered to be the critical news resource. However, actions must be taken to build people’s trust of television reporting during weather events. Ongoing information needs assessments would have highlighted this need; future assessments can help officials and media to be more resourceful in meeting those needs.

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7 The analysis here draws on the New York and Jakarta fieldwork and a policy and practice literature review (see Why Information Matters for the full bibliography).
8 See Annex II, The Qualities of Resilient Systems
2) **Information Landscapes:** In both countries, an intense uptake of new technologies has increased the reach of communication and created the potential for new spaces of engagement wherein communities can become more informed and self-reliant. This capability can enable more bottom-up forms of decision-making. The flip side of this technological engagement has in both cases been a pointed vulnerability: there were no redundant structures backing up the electrical grid in either city. Many residents were left without access to news and information because television, computers, and cell phones were useless without a power source when batteries ran out.

New technologies can be a critical tool to leverage community-led resilience practices. However, more critical communication systems (e.g. backup electrical sources) is critical to maintaining a free flow of information.

3) **Production and Movement:** Both contexts are characterized by problems with disconnected decision-making and communications across agencies and organizations, and unclear roles and decision trees across national and provincial/state level agencies. In Indonesia, provincial agencies like BPBD (the Provincial Disaster Management Agency) are still fighting for recognition and coordinating capacity within provincial disasters. Because their lines of communication and authority vis-à-vis the BNPB (the National Disaster Management Agency) are often unclear, the BPBD’s effectiveness is constrained. In the U.S. policy literature revealed, FEMA confronts a system of regulatory confusion and multiple layers of laws as previously existing agencies with their own priorities and objectives have been consolidated. Because of these unclear inter-governmental lines of authority and communication, coordination of action and communication with affected populations has been negatively affected.

**Observation:** Ongoing coordination, clear delineation of roles, and frequent communication are all critical to building workable relationships across agencies, organizations, and communities and thus to create a more integrated system.
4) **Dynamics of Access:** In both locations marginalized groups are subject to power dynamics that prevented their full access to information about climate events. Renters in Jakarta are not trusted by the “real” residents of flood-prone poor communities. The New York study revealed that older residents and particularly the elderly were much less frequent users of new technologies and social media. Thus any efforts to reach them through those media either during the storm or afterward were likely to be unsuccessful.

**Observation:** A lack of inclusiveness can take many forms, but is pervasive and can have negative impacts not just on the excluded populations, but from a systems perspective, on the whole society.

5) **Use:** In both Jakarta and New York, cynicism and distrust about mainstream media reports on severe climate events seem to have contributed to patterns in which residents became alerted to issues of concern via the traditional news media, but then engaged in a subsequent verification process through alternative, more trusted, information sources. In New York, the verification process would include actions such as consultation with online information sources (such as those provided by government agencies), personal observation, and phoning friends and family members telephone. In Jakarta, residents preferred to verify through photographs on social media and calling or meeting family and neighbors face-to-face to discuss facts and events.

**Observation:** The multi-pronged verification processes that happen in both locations highlight a natural redundancy of information at the hyper-local level. Additional flows of information through trusted sources can increase this redundancy.
6) **Impact of Information:** Both studies highlighted the complex relationship between information and decision-making. In New York, the drowning deaths in evacuation zones underline that not only do officials have to provide timely communications to affected people; people need to have the capacity, resources, and willingness to evacuate. The Jakarta research uncovered highly heterogeneous decision-making about whether to leave the home, when to go, where to go, and how to go. In both cases, it is clear that sending the “right” information at the “right” time to the “right” people is no predictor that people will make what officials consider to be the “right” choice.

**Observation:** Human behavior upon receiving information under stress and shocks is not easy to anticipate. However, New York research indicates that actionable information - communicated by trusted sources that can be verified - can help to make people more flexible and resourceful in their responses.

7) **Social Trust / 8) Influencers:** Community leaders that government decision-makers rely on may not be the most trusted purveyors of information during stresses or crisis. In Jakarta, the provincial government relied on the designated local community leaders (called the RW or RT) to convey information; research showed that there were many reasons why some community residents trusted neither these leaders nor their information during a flood. Similarly, in New York, police who drove through neighborhoods making announcements over loudspeakers and even knocking on doors found an unanticipated resistance to their news. Conversely, in both locations, networks of family and friends, and local community groups, were more trusted than some publicly-appointed leaders.

**Observation:** Contraction of trust during times of stress can have dire impacts on information flows and feedback loops. Building long-term relationships with alternative trusted local influencers and enabling additional community-based groups to drive resilience practices can increase **integration** among government, community, and other groups.
PART III: CONCLUSIONS

After preliminary investigations in Jakarta and New York, it is clear that the information ecosystems framework is valuable, and should be further refined after further implementation. The Eight Critical Dimensions helped identify areas of strength and weaknesses in community resilience that might have otherwise gone unnoticed, and to crystalize concrete recommendations for increasing the health of the information ecosystem, thereby building resilience. Using the framework also drew out unanticipated parallels between the two research Pilot cities.

Despite the level of information density in New York, in many ways the information ecosystem did not elicit healthy feedback loops during and immediately after Sandy in the way that city officials may have anticipated. It is clear that in preparing for the next storm, communities must lead in strengthening their information ecosystems, communicating their needs and experiences from the bottom up. While they must not lead from the top down, outsiders can help support this process by identifying appropriate communications to vulnerable populations; better connecting with information influencers; building trust in useful messages; enabling people to validate the information; and ensuring that the information is actionable.

Better understanding the relationship between information and people’s actions will be critical. Building better trust networks and identifying information influencers will clearly have to start at the hyper-local level. Weaknesses in infrastructure that relies too heavily on electricity will also have to be addressed. An incredible amount of locally-driven information innovation happens during disruption, innovation that is more trusted by the community than mass media because of its community roots. Beyond these observations, the information ecosystems framework has revealed multiple new insights that can and should be addressed outside of a crisis context.

The analysis of parallels between Jakarta and New York suggests that using the Eight Critical Dimensions as a lens can uncover unexpected trends across highly dissimilar environments. Further research should investigate more deeply the ways in which these two places can learn from each other’s experience. Such parallels can help facilitate bi-directional learning across geographical boundaries and economic differences. The additional study of 4-8 more cities, in various locations, at different economic levels, and facing different types of shocks and stresses will help to make the comparisons more robust and throw in to relief the very particular hyper-local qualities that have no parallel elsewhere.

The information ecosystems framework is founded on systems theory. This means that it is possible to make general conclusions based on research on a specific information ecosystem such as New York. However, even at its most stable, a system is always dynamic. This means constant monitoring is necessary; information inputs should respond to change. Even when a
system is disrupted, it will realign itself, though it may change or even transform significantly in the process. Information ecosystems will continue to exist – but will better support resilience if different components of it are strengthened. The Eight Critical Dimensions is a useful lens through which to identify the components that need strengthening. The ability of an information ecosystem to recalibrate after significant disruption is the measure of a community’s resilience. One of the key recommendations out of Embracing Change is that whether or not they are recovering from crisis, now is the time for cities and communities to use the information ecosystems framework to diagnose additional strengths and vulnerabilities.

The next step in the Embracing Change process is to offer practical guidelines for policymakers and planners for how to implement the framework. A companion to this report, “Mapping Information Ecosystems to Support Resilience: A Decision Support Framework,” a light, simple decision tool, leverages the body of Embracing Change research to provide a framework for decision-making and analysis. A dynamic tool, it offers actionable strategies for leveraging information ecosystems as a management support resource. The Framework is aimed at national, provincial, and local governments, and can help facilitate preparedness and assessment for response, and help government organizations understand how best to connect to the people they serve. Importantly, employing the Framework will shift decision-makers away from a Disaster Risk Response framework and towards a broader, resilience framework that integrates development and humanitarian concerns. The Framework will prompt groups to identify and challenge their assumptions, practice empathy, identify needs, assess gaps in current practices, and build strategies for action.

Further exploration will strengthen the initial steps made by Embracing Change. As a first step in that exploration, the Framework focuses on government; government decision makers are clearly only part of the team of actors that build resilience. The Framework is not intended for use by dispersed community networks, community organizations, or individual local actors. Both the Jakarta and New York research identified significant gaps in trust and information flows between “top” and “bottom.” However, the Framework not intended as a tool to build good trust and information flow between governments (at whatever level) and community organizations. Future work should create tools both for community-level actors to best assess how to build trust and communicate with governments, and to facilitate the collaboration and interoperability between “top” and “bottom.” Additionally, future work should create research tools so that the Eight Critical Dimensions can be successfully deployed by researchers in any country, at any level of analysis, from poor communities to within institutions themselves. Executing further research and implementing a broader array of tools will help ensure that an information ecosystems framework will become part of all significant resilience efforts. Internews’ experience and research has demonstrated that healthy information ecosystems are a root cause of furthering human progress. A broader, more integrated use of information ecosystems in resilience efforts is a goal critical to ensuring that this insight helps to improve human lives.
ANNEX I: THE EIGHT CRITICAL DIMENSIONS OF INFORMATION ECOSYSTEMS

| 1. Information Needs | • Information needs across different segments of the population, and how they change over time  
|                       | • The degree that information needs are known to information producers and consumers |
|                       | **General principles**  
|                       | • Populations’ information needs are diverse and changing, and sub-groups within a community will have vastly different information needs. Information and communication needs assessments are a critical first step in designing programs.  
|                       | • Information must be inclusive and relevant to all segments of the population, including at the hyper local community level. Policymakers and practitioners must have sufficient channels for listening and adapting to community feedback.  
|                       | • Information must be unbiased, and should not serve the interests of media organizations, the government, or others. Without locally relevant and actionable information, communities are left disempowered, helpless, and frustrated. |
| 2. Information landscape | • The physical and institutional infrastructures that support information production and flow, including media outlets, distributions systems, production units, etc.  
|                       | • Intermediary organizations: media, government, private industry, civil society  
<p>|                       | • The characteristics of information providers and their capacity to verify, filter, sort, and disseminate information |</p>
<table>
<thead>
<tr>
<th>General Principles</th>
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<tbody>
<tr>
<td>• While elements of macro infrastructure (e.g. national radio broadcasting networks, cell phone towers) are often the easiest to identify and support within media and information landscapes, Internews has found that the hyper local, community level information landscape is the backbone of healthy information ecosystems. Hyper local information is critical for inspiring action, and its flow depends on capable information providers and local influencers (please see the eighth dimension).</td>
</tr>
<tr>
<td>• Different groups access information through different means; understanding the information landscape ensures that information is matched with the most appropriate and resonant way to communicate it for impact.</td>
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<thead>
<tr>
<th>3. Production &amp; Movement</th>
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<tbody>
<tr>
<td>• The variety of types of information available (e.g. government services, community news)</td>
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<tr>
<td>• The producers of information and the owners of the means of production and dissemination</td>
</tr>
<tr>
<td>• The role of word of mouth, social media, bulletin boards, and other local information hubs</td>
</tr>
<tr>
<td>• The role of internet and mobile media as new, and rapidly expanding sources of information flows</td>
</tr>
<tr>
<td>• The variety of types of content available, and to whom</td>
</tr>
<tr>
<td>• Impact of information as storytelling</td>
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<thead>
<tr>
<th>General Principles</th>
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<tbody>
<tr>
<td>• Strengthening information flows is not just about building new tools or technologies; it is also about redundancy and coordination. Healthy information ecosystems are characterized by a diversity of sources capable of providing the same message. In particular, while sophisticated sources of information like SMS and TV are typical of more developed societies, these systems are often the most vulnerable to disruption.</td>
</tr>
<tr>
<td>• Strengthening information flows is also about richness of content – not just where and how information flows, but what types of information are available, how compellingly information is conveyed, and whether information is understandable and actionable.</td>
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<td>Section</td>
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</table>
| **4. Dynamics of Access** | - The environment in which information flows (e.g. political, cultural, time, cost, and other factors)  
- Ease of accessing, finding, using, sharing, and exchanging different types of information  
- Barriers to interaction and participation  
- Broader structures that influence access: governance, legal, political, economic, and infrastructural factors  
- Social inclusion  

**General Principles**  
- Power relationships and other forms of social constraints profoundly shape access to information. Understanding power dynamics is critical to designing for inclusive access.  
- Specific, contextual understanding of what access looks like on the ground is also critical.  
- Techniques such as design research, combining immersive observation and ethnographic investigative methods, may be the best way to understand the intrinsic constraints and motivations that drive behaviors around information, as well as build a nuanced picture of the dynamics of access. |
| **5. Use** | - Factors influencing information’s relevance to people: content, medium/format, source, literacy, habit  
- What consumers and audience do with information that is received  
- How information is processed, disseminated, and applied  

**General Principles**  
- Once information reaches its intended audience, there are many factors that influence whether and how it is actually used. Therefore, it cannot be assumed that an environment with plentiful information is necessarily one with a healthy information ecosystem.  
- Before it is used, information is often verified, validated, and triangulated at a hyper-local level through friends and trusted contacts |
| 6. Impact of Information | • The impact of information on individual and community opportunity, health, and economic development  
• Relationship between information, knowledge and behavior change  
• Community organization around different types of information  
• Effects on community planning and action  
• Effects on policy and implementation  
• The effect of information on civic engagement  
|---|---|
| General Principles | • Relevant, compelling, and accessible information has a positive impact on people’s lives in terms of their agency and overall well-being.  
• However, unless information resonates with people’s needs and interests, it will not foster agency and action.  
• Information may not always have a positive impact on knowledge and behavior change; in some cases, it may even perpetuate state influence over the architecture of public information and discourse. It may be that information production, distribution, and access are robust in a community; however, if information does not promote empowered decision-making (i.e. is primarily entertainment or “managed” news content), it will not actually foster the development of a more empowered or enlightened citizenry.  |
| 7. Social Trust | • Influence of trust networks on the flow and use of information  
• Trust building around information  
• Trust in information sources, medium, content  
• Disruptions in trust tied to information (or the lack of information)  
• Challenges in building trust around information flows  
| General Principles | • A healthy information ecosystem can only exist when information sources are trusted, and individuals have the ability to verify and validate information through their established trust networks.  
• Trust in information is ultimately influenced by a community’s social dynamics at the moment, coupled with any historical or cultural factors that may generally color attitudes about government, external intervention, crises, conflict, or other sociopolitical factors.  |
| 8. Influencers | • The people, organizations, and institutions that influence how different types of information flow  
• Builders of trust in information  
• Change in influence over time, especially during disruption  

**General Principles**  
• Influence rests on political, religious, economic, and social status. It can also emerge from disruptions of traditional social structures precipitated by specific events, or the advent of new technologies. The democratization of information and communication technologies means that control over information production and flows is more unpredictable than ever before.  
• Influencers can act as information bridges, connecting social groups that have weak or nonexistent ties. This is critical for ensuring that information flows are healthy and can adapt to function during change or disruption. |
ANNEX II: THE ROCKEFELLER / ARUP QUALITIES OF RESILIENT SYSTEMS

Reflective
Reflective systems are accepting of the inherent and ever-increasing uncertainty and change in today’s world. They have mechanisms to continuously evolve, and will modify standards or norms based on emerging evidence, rather than seeking permanent solutions based on the status quo. As a result, people and institutions examine and systematically learn from their past experiences, and leverage this learning to inform future decision-making.

Robust
Robust systems include well-conceived, constructed and managed physical assets, so that they can withstand the impacts of hazard events without significant damage or loss of function. Robust design anticipates potential failures in systems, making provision to ensure failure is predictable, safe, and not disproportionate to the cause. Over-reliance on a single asset, cascading failure and design thresholds that might lead to catastrophic collapse if exceeded are actively avoided.

Redundant
Redundancy refers to spare capacity purposely created within systems so that they can accommodate disruption, extreme pressures or surges in demand. It includes diversity: the presence of multiple ways to achieve a given need or fulfill a particular function. Examples include distributed infrastructure networks and resource reserves. Redundancies should be intentional, cost-effective and prioritized at a city-wide scale, and should not be an externality of inefficient design.

Flexible
Flexibility implies that systems can change, evolve and adapt in response to changing circumstances. This may favor decentralized and modular approaches to infrastructure or ecosystem management. Flexibility can be achieved through the introduction of new knowledge and technologies, as needed. It also means considering and incorporating indigenous or traditional knowledge and practices in new ways.

Resourceful
Resourcefulness implies that people and institutions are able to rapidly find different ways to achieve their goals or meet their needs during a shock or when under stress. This may include investing in capacity to anticipate future conditions, set priorities, and respond, for example, by mobilizing and coordinating wider human, financial and physical resources. Resourcefulness is instrumental to a city’s ability to restore functionality of critical systems, potentially under severely constrained conditions.

Inclusive
Inclusion emphasizes the need for broad consultation and engagement of communities, including the most vulnerable groups. Addressing the shocks or stresses faced by one sector, location, or community in isolation of others is an anathema to the notion of resilience. An inclusive approach contributes to a sense of shared ownership or a joint vision to build city resilience.

Integrated
Integration and alignment between city systems promotes consistency in decision-making and ensures that all investments are mutually supportive to a common outcome. Integration is evident within and between resilient systems, and across different scales of their operation. Exchange of information between systems enables them to function collectively and respond rapidly through shorter feedback loops throughout the city.

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9 The text on this page is taken from The Rockefeller Foundation | Arup, “City Resilience Index: City Resilience Framework,” April 2014, p.5
ANNEX III: NEW YORK INFORMATION ECOSYSTEMS PILOT - Methodology

As an extension of the research conducted in Jakarta, the New York study piloted the information ecosystems methodological approach to offer additional insight and inform future inquiry for strengthening information ecosystems within resilience research and planning. The methodological approach of the New York study complemented a Jakarta study completed in April 2014.

Key questions:
- What is the role of an information ecosystem in helping people adapt to change?
- How do information ecosystems transform during disruption? How do they function during recovery?
- How do information ecosystems contribute to resilience during disruption and recovery?
- What is the best way to strengthen information ecosystems to strengthen the resilience of communities?
- What are the particular characteristics of information flow within communities? Has this changed since Sandy? How does information flow between the “top” (government/recovery organizations) and the “bottom” (affected communities)?
- What are the differences and similarities across the two chosen field sites in Brooklyn and Staten Island? How does one determine the appropriate scale for a “hyper local” perspective?
- What is the relationship between influence and trust during an unanticipated crisis situation?
- What is the (likely complex) role of information in decision-making at the community level?
- What might we learn from better understanding the communities’ self-organizing capacities?
To answer these questions and help further develop our information ecosystems and community resilience frameworks, the New York Pilot takes a multi-method research approach. Fieldwork was conducted in June and July 2014.

<table>
<thead>
<tr>
<th>Methodology</th>
<th>Location</th>
<th>Respondents</th>
<th>N</th>
<th>Key issues for research</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantitative phone-based survey</td>
<td>Brooklyn near the water; across Staten Island</td>
<td>Residents of the two areas during Superstorm Sandy (80%); residents of the two areas that moved in after Sandy (20%)</td>
<td>750, divided evenly between the two geographic areas</td>
<td>Information sources, trust in information, neighborhood influencers; the relationship of all these elements to post-Superstorm Sandy recovery</td>
</tr>
<tr>
<td>Focus groups</td>
<td>2 for each location as above</td>
<td>People who self-identify with qualities that indicate they are information influencers</td>
<td>4 groups total; 8-10 per focus group; N=32-40</td>
<td>Information flow within the community on issues related both to Sandy and other important issues of the day; community trust networks; decision-making in the context of cycles of resilience; and resilience factors in information ecosystems</td>
</tr>
<tr>
<td>Policymaker in-depth interviews</td>
<td>Anywhere in NYC; people with a citywide perspective</td>
<td>New York City disaster risk reduction decision makers</td>
<td>5</td>
<td>How do decision makers incorporate elements of information ecosystems framework into their current approach to resilience (even if unconsciously)? Whether / how could information flow maps and other information-focused decision tools might be useful?</td>
</tr>
<tr>
<td>Community leader in-depth interviews</td>
<td>Same 2 locations as above</td>
<td>Community leaders who have been instrumental in helping their home area to recover (and perhaps, bounce forward) since Sandy</td>
<td>10 (5 in each location)</td>
<td>Role of community innovation in building complex adaptive resilience, successes and challenges in building resilient communities and resilient information ecosystems, and the role of trust and influencers in building community resilience.</td>
</tr>
</tbody>
</table>
Credits:

The New York research was undertaken by Professor Philip Napoli (Rutgers University), together with a team of graduate students: Jessica Crowell, Jack Harris, Qun Wang, and Reynir Winnan. The analysis of New York City following the Eight Critical Dimensions in Part II draws heavily from Napoli’s report on their research. Internews will publish his longer report detailing the findings of the research in December 2014.

Tara Susman-Peña (Internews, Senior Research Officer) is the research lead for the Embracing Change project and the principal author of the report. Natalie Chang (Senior Program Associate, Internews) edited the report. Amanda Noonan (Internews, Director of Research and Learning) provided invaluable feedback on earlier drafts of this report.

Front cover photograph of Occupy Sandy communications hub courtesy of the Church of St. Luke and St. Matthew, Brooklyn

Graphic elements on the Eight Critical dimensions by VROS Design.