Bloomberg Philanthropies

Resilience Task Force Toolkit

A Government Official's Guide to Managing Resilience Transformation

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THE STAFF AND CONTRIBUTORS OF NEW YORK CITY SPECIAL INITIATIVE FOR REBUILDING AND RESILIENCY, AND US VIRGIN ISLANDS HURRICANE RECOVERY AND RESILIENCE TASK FORCE, ON WHOSE WORK THIS DOCUMENT IS BASED.

BACKGROUND

PURPOSE

This document was developed by Bloomberg Philanthropies and the Commonwealth Secretariat as a part of an agreement to work together to aid international trade, innovation, and sustainability. As global warming intensifies and increases the impacts of natural disasters, this guide is intended to help organize efforts to examine resilience across the globe.

EXPERIENCE

Contributors of this document include government leaders, consultants, and service providers who have worked on recovery efforts and climate resilience strategies across the globe. These individuals include officials that led New York City's response to Hurricane Sandy (2012) and its long-term resilience as well as recovery efforts in the U.S. Virgin Islands following Hurricane Irma and Hurricane Maria (2017) as well being informed by the first months of the COVID-19 pandemic. While each disaster requires a unique response, a guiding approach highlighted in this guide is the need to bring together qualified cross-sector partners and a collaborative strategy for success. Two examples are the Special Initiative for Rebuilding and Resiliency in New York City and the Hurricane Recovery and Resilience Task Force in the USVI. Both initiatives worked with government and private partners to produce documents detailing the disasters as well as response efforts and recommendations, including government policies and resources needed to address future disasters.

Through interviews, research, and review of public documents regarding natural disasters, this guide shares key lessons and best practices for consideration in organizing efforts to examine resiliency in order to strengthen whole of community preparation and response.

HOW TO LEAD A RESILIENCE TRANSFORMATION

THIS GUIDE OUTLINES THE STEPS NEEDED TO CONDUCT A RESILIENCE EFFORT IN A CITY, STATE, OR COUNTRY. AT A HIGH LEVEL IT ENUMERATES THE FOUR PHASES OF RESILIENCE PLANNING WHILE GOING INTO DETAIL ON HOW TO CONDUCT A PRE-EVENT OR POST-EVENT RESILIENCE EXAMINATION.

- DAY ONE, BEGINNING TO BUILD A MORE RESILIENT NATION
- PRE-ASSESSMENTS
- RESPONSE OVERVIEW
- RESILIENCE REPORTING

DAY ONE

As an official charged with building a culture of resilience, both in and out of government, the task can feel daunting on day one. With all large efforts towards governmental and cultural change, leadership is key. Ensuring that national political leadership believes in the value and goals of a resilience effort is important for a truly broad-based effort. Communicating that the goal of resilience transcends political boundaries and cuts across party lines will help to build trust before decisions need to be made about allocating resources later in the process. Empowering luminaries from diverse political and economic backgrounds to help champion the cause of resilience is important.

The commitment to resilience should be transparent and measurable. When governments publicly commit to get something done and provide regular updates, confidence increases and teams working on the effort can have hard deadlines to shoot for.

PRE-ASSESSMENTS

Before a detailed resilience study can be conducted, baseline research about underlying factors affecting resilience must be understood. These factors include research about climate risks, data about community health, major technological hazards, issues related to other major risk factors such as famine, political instability, civil war, and others. Cultivating strong cross-sector partnerships is key to a comprehensive assessment effrort. This baseline research can be gathered from academic institutions, think tanks, interest groups, non-governmental organizations (NGOs), and leaders in civil society. The overall hazard profile will inform the underlying assumptions and direction of the following Resilience Audit.

RESPONSE OVERVIEW

In the aftermath of an event, an After Action Review (AAR) should specifically look at the performance of response organizations both in and outside of government. This AAR should focus on events and how specific agencies reacted to them, as well as the efficacy of pre-planning efforts. This AAR should not go too deep into the systemic issues of infrastructure, response organizations, governments, or other underlying problems. Operational assessments about the response itself are important but are separate from resilence reporting.

RESILIENCE REPORTING

In the aftermath of an event, or in consideration of a future event, systemic issues of resilience need special attention. These issues are related to, but distinct from, response AARs. The steps below provide a roadmap for conducting a detailed Resilience Audit that can be tailored to an individual nation or jurisdiction.

1. LAY THE GROUNDWORK

Ensure that you have full support from top leadership. Get a core team in place. Define broad resilience goals that are ambitious, yet achievable. Announce a commitment to launch a special initiative to achieve goals. Recruit and appoint a diverse, high-level advisory board made up of issue experts. Build stakeholder support inside and outside of government.

2. PREPARE TO LAUNCH

Anticipate budget needs and identify resources. Secure funding, and in-kind commitments from partners. Hire and deploy qualified staff. Engage climate experts, specialists, and consultants. Set timing expectations for the work.

3. DOCUMENT PLANS

Assess the scale of climate hazards in order to inform stakeholders. Estimate climate risk to communities and infrastructure. Set resilience standards. Develop initiatives and timelines to meet goals.

4. IMPLEMENT

Any report is only as good as the ability to implement its recommendations. From the beginning the effort to identify challenges around resilience of infrastructure and systems, the public (and internal) messaging should set expectations that the report and its findings are just the beginning. Only through sustained commitment from government and other sectors will real change occur.

1. LAY THE GROUNDWORK

GET A CORE TEAM AND ANNOUNCE THE REPORT

Have top leadership state that resilience is a priority.
This will encourage departments and teams to dedicate resources and attention to resilience efforts and create a culture around this work.

Assemble a capable team that reports to top leadership.
Many local governments now have a dedicated team focused on resilience. To be most effective, this team must be empowered to work across government departments. Teams should be led by a senior official, equivalent to ministers or department heads.

Announce government-wide resilience commitments.
Publicly announcing government's commitment to resilience efforts sends an important message to stakeholders. Government has a responsibility to be rigorous, using the best available data and climate science. Simple but important questions to ask include: What happened in past disasters and why? What could potentially happen in the future based on what climate science tells us? What are we going to do about it?

BUILD HIGH LEVEL SUPPORT

Establish an advisory board.
Identify and appoint 10–15 leaders from the private, nonprofit, and government sectors to serve on a resilience advisory board or committee. These individuals can help define the goals, provide counsel, tap resources, and engage stakeholders. It is important to clearly state the board's intentions and expectations for members, such as meeting participation.

With the help of a core team, identify resources across government and seek insights from heads of ministries and departments. Host inter-governmental meetings that foster knowledge-sharing, trust, and collaboration. When teams are used to coming together, it will strengthen any emergency response efforts.

Identify key stakeholders.
Since disaster management cannot be achieved by government alone, strong collaboration is essential. Identify and meet with cross-sector partners, such as foundations and NGOs, who bring knowledge and expertise.

Bring in facilitator support.
Strong collaboration between board members, government departments, and other stakeholders is not always easy. Consider an outside facilitator to help build trust, identify roles, and identify a shared language among partners.

Compress the support building period if you are working after a disaster.
Everyone should already understand why resilience planning is important. Give short briefings about the team and the report and move quickly into the report development process.

SET THE SCOPE OF THE REPORT

Clarify your definition of resilience.
Resilience is simply the capacity to recover quickly from difficulties, so it's important to define what your resilience means or the priorities for your government. For example, it can be linked to infrastructure, economic growth and equity, public safety, or all of the above. The more broadly you define resilience, the less (with available resources) you will get done.

Define your areas of focus.
Include sections and topics that are sectoral (for example: power, transportation), geographic (to focus on areas that need particular attention), or cross-cutting (like funding and implementation). Content should be clear and concise and sections should ideally be linked to one ministry or agency that plays a lead role in that issue or effort.

Damage assessments.
Post-disaster funding frequently corresponds with damage assessments as well as changes to codes, standards, and risk models. The efficient collection of information on overall damage, classifications of types of damage and of how it differs from what the risk models had predicted can lead to more support.

HOW TO STRENGTHEN A RESILIENCE CULTURE ACROSS GOVERNMENT

When resilience work does not feel like a priority for leaders across government, there are still many ways to productively promote initiatives and strengthen sustainability efforts. Examples include:

Data, mapping, and science research.
Organize lists of important infrastructure, map locations, capture terrain details, model storms and floods, and develop local climate projections.

Stakeholder outreach.
Work with civic leaders and decision-makers inside and outside the government about present and future climate risks. These discussions can lead to better prepared communities when disaster strikes.

Pilot projects.
Identify small projects that can be supported with existing resources and can inform larger efforts. Document outcomes and share results with the leadership of other ministries or departments.

Communications.
Work with your communications team to educate and inform stakeholders identify appropriate features for press outlets. Local media outlets can help educate and inform the public about climate science, the biggest risks, and their role in resiliency and preparedness.

HARDENING, MITIGATION, RESILIENCE

Hardening means preparing infrastructure to survive disasters by making it stronger or adding protective barriers around it (e.g., elevating a power transformer).

Mitigation includes hardening. It also means making sure the infrastructure is not damaged in the first place (e.g., by moving it) and creating enough redundancy to make sure that systems keep working even if some of their infrastructure is damaged (e.g., by making sure a segment of a power system does not have a single point of failure).

Resilience includes mitigation. A broad definition of resilience is the capacity of individuals, communities, institutions, businesses, and systems to survive, adapt, and thrive no matter what kinds of chronic stresses and acute shocks they experience. It also means ensuring that if a system fails, the communities that depend on it feel the failure as little as possible.

2. PREPARE TO LAUNCH

SECURE FUNDING

Create a budget that addresses anticipated needs.
Budget considerations include staffing, consultants, mapping services, graphic design, printing, travel, meetings, technology, and communications (see table below: Sample budget for a small resilience effort.)

Identify government resources.
Government investment in resiliency efforts sends an important message to stakeholders. Identify existing resources across departments, including potential staff, and new positions that can be funded and are mission aligned. Document gaps for future budget adoption and needs that may require philanthropic support.

SAMPLE BUDGET FOR A SMALL RESILIENCE EFFORT

USD thousands

Staff and consultants	Staff (120 person weeks)	270	
	Consultants	25	
		295	**76%**
Contract services	Graphic design	5	
	GIS services	15	
	Report printing	2	
		22	**6%**
Office, travel, and events	Office equipment and furniture	20	
	Other office expenses	10	
	Travel and technology	20	
	Events	10	
	Other communications	10	
		70	**18%**
Total		**387**	**100%**

WORKING ON THE REPORT WITH LIMITED RESOURCES

Pool resources.
Work across government departments to identify potential writers, contributors, and designers to support the report.

Seek partners.
Work with academic and research institutes that can provide services and identify faculty or students as contributors. Partners can also increase outreach channels.

Secure sponsorship.
Identify and secure private support from appropriate sources that can help fund the report or donate in-kind services.

Keep it digital.
Printing is costly, so consider making this a digital only document and share it on-line and through other digital channels.

SECURE STAFFING

Secure sufficient staff for the tasks at hand.
Team sizes vary based on needs and existing capacity. For example, in the USVI, with a population of 100,000 people, eight full-time employees worked on the report. In New York City, home to 8.6 million people, there were two dedicated resilience staff members prior to Hurricane Sandy in the Mayor's Office of Long-Term Planning and Sustainability, which grew to approximately 40 working on the post-hurricane Special Initiative for Rebuilding and Resiliency, and 15 assigned to a newly created Mayor's Office of Recovery and Resiliency.

Find the best people.
Securing the talent and expertise you need is not easy. Work with cross-sector partners to identify candidates and ensure that hires are the right fit. Keep in mind that it takes time to build relationships, which are easier to develop prior to emergency response.

Know when to engage volunteers.
Volunteer support is best suited for a well-defined project and should not substitute core staff. Successful volunteer engagement also requires management.

Bring in diverse perspectives.
Having staff members that bring different experience and backgrounds is valuable in thoughtfully and equitably identifying and responding to public needs.

Confirm project management structure.
Have one person for each sector to ensure accountability and that project's deliverables. This will also streamline communications to stakeholders.

Assign fundraising responsibility.
Seeking and securing resources as well as managing reporting requirements is a full-time role. Keep in mind that each funding source comes with its own set of requirements and procedures, and accountability is essential.

BRING IN EXPERTS AND CONSULTANTS WHEN NEEDED

Form a panel of experts to support climate and risk work.
This panel can tell you what kinds of models, projections, and the level of precision you need for your work. They can also help you check the quality of the work someone else prepares.

Hire consultants with deep, specialized expertise for sector work.
Tapping expertise can be vital. For example, in the power sector, it can be a regulatory lawyer who understands how to structure tariffs to support renewables. In buildings, it can be an engineer who develops flood-proofing standards. If you spend money on consultants, consider these kinds of specialist needs first.

Consider large generalist consultants for data collection and processing.
In New York City and the USVI, consultants were brought in to estimate overall post-hurricane damage efficently and effectivly. They were not used for additional sector work due to the cost. They rarely do enough work in one place long enough to understand the area well.

Keep sector responsibility with full-time staff.
The most important part of sector work is developing relationships with agencies that will later be implementing the report's initiatives. If a consultant leads sector work, those relationships will disappear when the consultant leaves.

Pay consultants based on their outputs.
If you define the outputs more generally ("first draft," "second draft," etc.) you will have to pay for the work even if it is far less detailed than what you wanted. Consider a fee structure, such as paying 30 percent of the fee once they complete a set of 10 particular analyses.

IDENTIFY SUPPORTING RESOURCES

Secure a physical location for the entire team.
When possible, having a central space can help strengthen collaboration and team building among part-time and full-time staff. Having a physical place will also help those who are on part-time assignments from their departments to do a lot more than if they had stayed at their regular desks.

Hire support staff.
You will need a team of mapping and GIS (geographic information systems) experts, writers, editors, graphic designers, marketers, and a printing source. All of these people should be in place within a month or two of starting efforts. Wherever possible, hire local.

Identify contact points in other parts of government.
Ask each department or ministry for one or two people to work with, for instance, a senior representative and a liaison for data and organize meetings.

SET TIMING EXPECTATIONS

Be realistic about the time it will take to produce a report.
Typically, these reports take seven to eight months to complete. Allow time for review, stakeholder input, refinement, and revision.

3. DOCUMENT PLANS

DEEPEN AND BROADEN THE STAKEHOLDER WORK

- **Have departments create lists of all stakeholders**
- **Identify existing groups that can increase outreach channels**
- **Consider vulnerable and harder to reach populations and employ different engagement strategies**
- **Convene meetings and discussions that are inclusive, including consideration of locations and formats**
- **Listen to ideas, take in feedback, and course-correct when needed**

ASSESS THE SCALE OF CLIMATE HAZARDS

Confirm data is accurate and up-to-date.
Climate predictions change over time and so do the best mitigation strategies. Rely on your network of climate experts and partners to ensure that information and modeling is accurate and not outdated.

Pay for new hazard assessment work and expert oversight.
Having the highest quality output in the shortest time is the goal. Consider working with an academic partner that may be able to provide work in-kind (typically for climate projections, more challenging for flood maps).

Understand how your hazard assessment was done.
There is not one "right" way to conduct a hazard assessment but understanding the methodology used is essential to be able to answer stakeholder questions and identify any gaps for future assessments.

Dedicate resources to the modeling processes.
Uncertainties come with landscape measurements, storm measurements, and sea level rise estimates. Modelers make mistakes. What you put into the modeling process can have enormous impact. In New York City, staff members worked for several months with contractors who were developing flood maps for FEMA. This work helped prevent several mistakes, which would have increased insurance premiums for many tall buildings in Lower Manhattan if they had not been caught.

Present risks to the public in a way that conveys the seriousness of the issue.
While data and statistics are vital to mapping a response strategy, public information should be delivered in accessible and thoughtful language. Consider the stories, imagery, and diverse voices that can speak to personal impact and draw attention to actions that need to be taken.
(see sidebar on page 14: Return periods and probabilities of exceedance).

Present risks to decision-makers in a way that can help them take action.
Talk to the decision-makers about the format in which they need to get their risk assessment and get consensus on the source of information to avoid potentially competing perspectives and goals.

GLOBAL AND LOCAL CLIMATE PROJECTIONS

Climate models tell you what could happen to climate and sea levels depending on how much carbon humans will emit. They work based on grids; the finer the grid, the more precise the results—and the longer it takes to run them. Scientists who run these models for the whole world and release their results to the public usually do it with grid cells that are around 100x100 km. If you want a smaller grid for working in a densely built place you have to make your own local projections. If you do, you can bring grid cells down to 1x1 km and also consider local issues like land subsidence (how quickly land is sinking for geological reasons) and, or, train the models on local climate data from the past (though you can be limited by how much data you have, at what resolution, and how much you trust it).

COASTAL FLOOD MODELS

A coastal flood model tells you, for any particular storm, how much a point on land will flood. You feed it hundreds or even thousands storm possibilities and then use the results in one of two ways. The first way is that you find out the worst that someplace could flood (which is what emergency managers do when they draw evacuation maps, often using a model called SLOSH). The second way is that you see how likely, in any given year, that place is to flood at or above a given level (which is what, in the U.S., FEMA does when it makes flood maps to which it ties flood insurance rates, usually using a model called AdCirc that does roughly the same thing that SLOSH does but more slowly, more precisely, and at a higher cost). If you want to know how either of the above changes when sea levels rise, you can add your sea level rise estimates to present-day results (faster, cheaper, and less precise) or run the models again with the sea level rise assumptions built in (a lot slower, more precise, and a lot more expensive).

RETURN PERIODS AND PROBABILITIES OF EXCEEDANCE

Storms and the floods that they bring are often talked about in terms of annual probabilities of exceedance and return periods. The former shows the chance that, in any given year, flooding from a storm will meet or exceed a given level (so, in a given location, the chance that flooding will meet or exceed 3 meters can be 1 percent a year whereas the chance that it will meet or exceed 5 meters can be 0.2 percent a year). If you invert the probability of exceedance, you get what is called the return period, so a 1 percent chance turns into 1/100 return period, which is colloquially—and somewhat misleadingly—spoken of as "1 in 100 years storm." If you want to understand the chances of a given location flooding at least once in a given period, you calculate the chances of that not happening at all and subtract that from one. So if the chance of flooding exceeding 3 meters is 1 percent in any one year, the chance of it not happening in the next 30 years is (1–0.01)30 = 0.9930 = 0.74, which means that the chance of it happening is 1 – 0.74 = 0.26, or 26 percent, which is rather more likely than the phrase "1 in 100 years storm" might make you think.

		Chance of flooding meeting or exceeding a given level one or more times in the next			
Annual probability of exceedance	**"Return period" (1/probability of exceedance)**	**10 years**	**30 years**	**50 years**	**100 years**
2%	50	18%	45%	64%	87%
1%	100	10%	26%	39%	63%
0.50%	200	5%	14%	22%	39%
0.20%	500	2%	6%	10%	18%
0.10%	1,000	1%	3%	5%	10%

ESTIMATE CLIMATE RISKS TO COMMUNITIES AND INFRASTRUCTURE

Understand what went wrong in the past and why.
Some basic but essential questions are key to resilience work. Structural questions include:

- Did the standards for this type of structure require enough protection for the kind of event that caused the damage?
- Did the structure actually meet the standards when built?
- Was the structure properly maintained afterwards?
- If the arrival of the event was anticipated in advance, was the structure properly prepared for it?
- Considering the answers to the questions above, what would it have taken to avoid or lessen the damage?

Assess risk using a qualitative template.
Have every sector lead fill out the template for their sector as a whole.

Assess risk in more detail for the biggest hazards and important assets.
Prioritize risk assessment calculations. In New York City for example, height measurements of different assets were taken for flooding in storm surges with either 1 or 0.2 percent probability of exceedance at that time and in the 2050s (focusing especially on the more critical assets, such as power plants and power transformers). They also calculated the possible increase in energy demand from a future rise in temperatures.

Run a rough overall assessment of how risks will change over time.
Running a detailed sector-based assessment from the ground up will take far too long and each sector will make decisions based on its own models and approaches. Instead, identify a risk model that has already been created and can quickly be adapted. New York City worked with a reinsurance company. Rough assessments can also be done based on percentage reductions in GDP in past comparable events.

Think of all risk assessment results in terms of orders of magnitude.
The results have three sources of uncertainty: valuing assets, estimating damage to assets in a given kind of event, and likelihood of event occurring in the first place. These compound: 30 percent uncertainty in each can make the final result vary almost sevenfold (0.7*0.7*0.7 = 0.343; 1.3*1.3*1.3 = 2.197).

DEVELOP RESILIENCE INITIATIVES

Propose standards for the kinds of events that each sector should withstand.
There are three constraints to consider: (1) how much a standard is going to cost vs. how much funding is available, (2) how hard it is going to be to implement considering what is already built, and (3) how big the gap is between what those who control a sector want (based on their estimates of possible asset damage and loss of revenue) and what is best for the public (based on the consequences of loss of service, which are almost always greater).

Develop initiatives to meet the proposed standards.
Be ambitious and aim for more than what there is funding for at the moment. Include planning initiatives when more information is required ("conduct a study to assess X"). For most sectors, consider the issue of single vs. multiple lines of defense (e.g., constructing a single flood wall vs. retrofitting hundreds of individual homes). The former may be cheaper and easier, however the latter is more reliable.

Make it easy to track progress and include short-term goals to go with long-term ones.
Tracking outcomes is essential to inform future efforts and the allocation of funding, both public and private. For any goal that is more than five years out, include sub-goals that need to be met every year along the way.

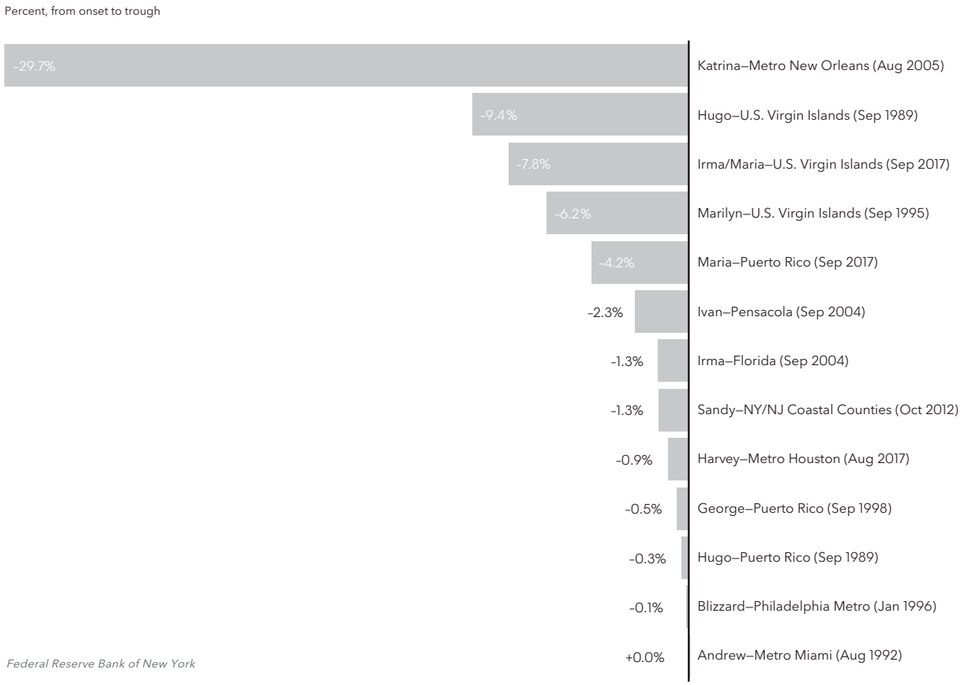
Make sure the initiatives tell a story.
For each initiative, explain the problem, scope of work, what the initiative is, how it will address the problem, and what actions government will take (including a brief "How the system works" sector, in the beginning of every chapter can help readers increase their understanding of the process). Organize initiatives into three to seven groups per sector that will make it easy to tell a story about what will be happening in the sector overall. In the USVI, the four groups for the energy sector's 17 initiatives were *Transform the generation portfolio, Modernize the grid, Fortify infrastructure against climate risks, and Strengthen energy planning and governance structures*). Produce an overall spending figure for public knowledge ("City proposes with $X billion resilience plan"), but do not necessarily break it down by sector or by individual initiative (those estimates take a long time and can change significantly). Include a tracker of all of the report's initiatives at the end.

NYC climate risk assessment template for the electricity system

Major risk Moderate risk Minor risk

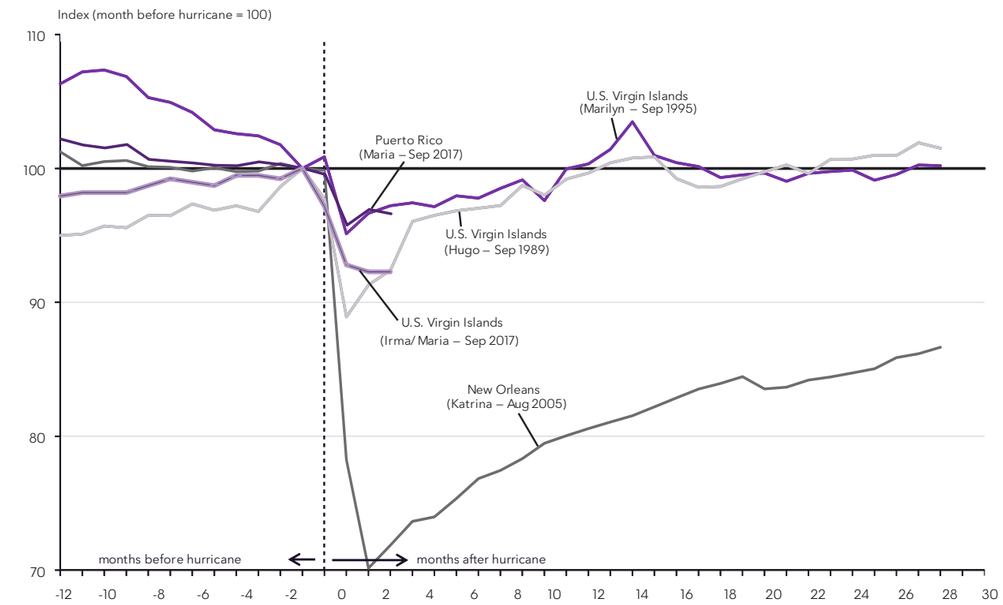
	Scale of impact			
Hazard	Today	2020s	2050s	Comments
Gradual				
Sea level rise				Minimal impact
Increased precipitation				Minimal impact
Higher average temperature				Minimal impact
Extreme events				
Storm surge				Much of the critical infrastructure is in floodplains; flood risks will become worse over time
Heavy downpour				Minimal impact
Heat wave				Increased risk of outages due to the impact of heat waves on peak demand and on electric infrastructure
High winds				Risk of damage to overhead power lines

Local job loss following natural disasters



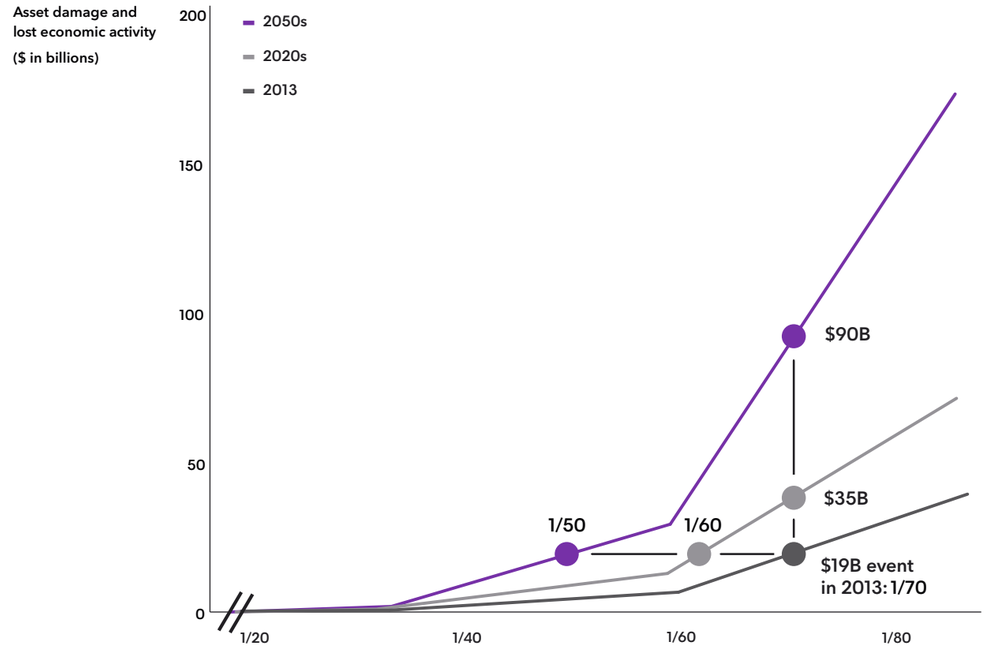
Federal Reserve Bank of New York

Employment paths after hurricanes



Federal Reserve Bank of New York based on data from U.S. Bureau of Labor Statistics and Moody's Economy.com

NYC future risk projections



Part of the initiative tracker for the Coastal Protection chapter of the NYC SIRR report

Initiative	Lead city agency	Milestones for completion, assuming funding		10-year capital / study cost (preliminary estimate, in $ millions, nominal)	Funding source
		By end of 2014	By end of 2020		
INCREASE COASTAL EDGE ELEVATIONS					
COASTAL PROTECTION					
1. Continue to work with the USACE to complete emergency beach nourishment in Coney Island.	DPR	Complete beach nourishment projects.	--	40-60	USACE
2. Continue to work with the USACE to complete emergency beach nourishment on the Rockaway Peninsula.	DPR	Complete beach nourishment projects.	--	100-125	USACE
3. Complete short-term beach nourishment, dune construction, and shoreline protection on Staten Island.	DPR	Complete beach nourishment and related projects.	--	10-20	FEMA
4. Install armor stone shoreline protection (revetments) in Coney Island.	OLTPS	Begin design.	Complete project.	20-40	CDBG
5. Install armor stone shoreline protection (revetments) on Staten Island.	OLTPS	Begin design.	Complete project.	20-40	CDBG

DPR: Department of Parks and Recreation; OLTPS: Office of Long-Term Planning and Sustainability; USACE: US Army Corps of Engineers; FEMA: Federal Emergency Management Agency; CDBG: Community Development Block Grant

NYC future risk projections

Chronic hazards		Baseline 1971-2000	2050 Middle range	2050 High end	2100 Middle range	2100 High end
Average temperature		54°F	+4.1 to 5.7°F	+6.6°F	+5.8 to 10.4°F	+12.1°F
Precipitation		50.1 in.	+4% to 11%	+13%	-1 to +19%	+25%
		Baseline 2000-2004	2050 Middle range	2050 High end	2100 Middle range	2100 High end
Sea level rise		0	+11 in to 21 in.	+30 in.	+22 in. to 50 in.	+75 in.
Extreme Events		**Baseline 1971-2000**	**2050 Middle range**	**2050 High end**	**2100 Middle range**	**2100 High end**
Heat waves & cold events	Number of days per year with maximum temperature at or above 90°F	18	39 to 52	57	-	-
	Number of heat waves per year	2	5 to 7	7	-	-
	Average heat wave duration in days	4	5 to 6	6	-	-
	Number of days per year with minimum temperature at or below 32F°	71	42 to 48	52	-	-
Intense precipitation	Number of days per year with rainfall exceeding 2 inches	3	4	5	-	-
		Baseline 2000-2004	2050 Middle range	2050 High end	2100 Middle range	2100 High end
Coastal floods at the Battery	Future annual frequency of today's 100-year flood	1%	1.6% to 2.4%	3.6%	-	-
	Flood heights (feet) associated with 100-year flood	11.3	12.2 to 13.1	13.8	-	-

Source: New York City Panel on Climate Change

MANAGING THE REPORT PROCESS

Manage the team:

- Bring teams together frequently to brief them with updates and share information
- Clearly assign work and deadlines among content team and stakeholders to be able to set deliverables and manage expectations
- Make sure the sector leads attend community meetings (online or in person), since strong collaboration is key in the report process
- Look out for burnout among team members and encourage time off when needed. This work is meaningful yet overwhelming at times

Manage the writing process:

- Require clear writing without jargon and excessive formality
- Use chapter and section templates, especially in the beginning, to help guide content development
- Have the editors make a style guide toward the end of the process that sets spelling and usage standards (e.g. Oxford comma or not?)

Manage the design process:

- Get designers onboard early and start prototyping sample layouts
- Prepare to go through multiple iterations of design for each chapter. There will always be something to adjust or to correct—chart placement, header style mismatch, missing footnotes, and more
- Make sure the photos are high enough quality for print: 300 pixels per inch is the standard, so a photo that covers an 8.5"x11" sheet needs 2,550x3,300 pixels

Manage the release:

- Plan a release announcement, with partners, which the mayor, governor, or Prime Minister will give the keynote
- Provide a confidential (embargoed) briefing for press the day before announcement, since the content is complex
- Give outside experts and partners a longer technical briefing just before the event to better prepare spokespeople
- Disseminate report widely. Utilize departments and partnering organizations as well as libraries and community centers in the area. Plan a digital strategy with cross-sector partners to expand reach

4.IMPLEMENT

Transition the team.
Funding permitting, the team can become a permanent government office for resilience work– many Mayor's, Governor's, and Prime Minister's Offices now have an Office of Resilience Planning and Implementation. This team can work closely with stakeholders in and outside of government, organize events, and release annual progress reports on the report's initiatives.

Build capacity across government.
Since resources and staff capacity can vary greatly across departments, look for ways to enhance collaboration, coaching, knowledge-sharing, and promote the efforts of well performing teams. Resilience initiatives can serve as a great unifier.

Evolve, but stay focused.
Needs and priorities can change focus over time, but your report should help to maintain focus on goals and stated deliverables. Guard your mandate, and if you are going to expand your mission, do it publicly and consciously – which may require a new or amended report.

RESOURCES SECTION:

1. CLIMATE SCIENCE

Center for Climate and Energy Solutions
https://www.c2es.org/content/climate-resilience-overview/

U.S. Climate Resilience ToolKit
https://toolkit.climate.gov/

World Resources Institute
https://www.wri.org/our-work/topics/climate-resilience

2. AFTER ACTION REPORTS

A Stronger, More Resilient New York
https://www1.nyc.gov/site/sirr/report/report.page

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